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TITLE: Simulation Learning: PC-Screen Based (PCSB) versus High Fidelity Simulation (HFS)

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14. ABSTRACT This project developed and tested a model to compare different types of simulation supported training for trauma nursing skills among military and civilian nurses. Evaluation outcomes included measurement and comparison of changes in learning, knowledge, skills & critical thinking, and attitudes (KSA), and cost effectiveness for PC screen based (PCSB) vs. high fidelity (HF) simulation. HF and PCSB training sessions (cervical spine immobilization, CAT tourniquet application, nasopharyngeal airway insertion) and a model for assessing learning and cost benefit outcomes were developed and pilot tested. We found that both military and civilian nurses had an equal improvement in learning regardless of assigned simulation training group (HF or PCSB), and HF simulation is more expensive (\$410) per session, compared to PCSB training (\$55). Based on these findings, we conclude that for simple trauma nursing skill training, PCSB simulation supported training is cost effective and achieves the same learning outcomes when compared to HF simulation supported training. We recommend that HF simulation should be reserved for more complex training needs that require significant teamwork and human interaction. Limitations include a small sample; we recommend that this model be validated with a larger sample.					
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INTRODUCTION:

As the number and complexity of disasters increases across the world, increased attention is being paid to disaster and trauma nursing. Since 2001, the US has experienced numerous significant natural, technological and human made disasters, and presently, there are a large number of military nurses directly involved in providing care to wounded soldiers on the battlefields of Iraq, Afghanistan, and other areas throughout the world. Core disaster nursing competencies have been identified, but we have not yet been able to identify the most efficient and effective methods for competency-based, simulation supported disaster nursing education. Identification of methods for training the nursing workforce with regards to essential trauma nursing functions will assure a more competent nursing workforce and serve to reduce error and improve trauma victim outcomes. The purpose of this project was to identify the most efficient and effective method for teaching hands on trauma nursing skills to military and civilian nurses. This research effort developed and pilot tested an evaluation model used to compare different learning outcomes and cost effectiveness for PC Screen based (PCSB) learning versus high fidelity (HF) simulation supported learning for military and civilian hands on disaster and trauma nursing skills. A sample consisting of military and civilian registered nurses (N=44) were randomly assigned to participate in one of two different training methodologies – either PCSB or HF – for selected trauma nursing skills, (upper airway management – nasopharyngeal airway insertion, bleeding control - application of a CAT tourniquet, and cervical spine immobilization – application of a cervical collar). Comparable training lesson plans were developed for each hands on trauma skill and the competency of each trainee was evaluated at the pre, immediate post and six week post training periods by an evaluator who was blinded with regards to the trainees' prior experience as a professional nurse, as well as the assigned method of training intervention. Cost benefit analysis was conducted for each type of simulation training method (PCSB and HF). The project was conducted at two research sites, namely: the University of Hawaii at Manoa (UHM), and the Tripler Army Medical Center (TAMC). There were two principal investigators (PI) on the project, one from the University of Hawaii (Dr. Kristine Qureshi) and one from the US Army (COL Denise Hopkins-Chadwick). The model developed is useful for future research about the best methods for simulation supported teaching of hands on trauma nursing skills to military and civilian clinicians in terms of learning and cost benefit. High fidelity simulation is an expensive method of training; therefore, it is important to understand the costs associated with different training methods relative to learning outcomes.

This is the final report for the project. The project timeline, tasks, and progress status can be seen as a summary view on the attached Gantt chart (Appendix A). The information below describes in greater detail the work that has been accomplished for each of the project tasks during the project.

BODY:

Task 1. Organize the project

a. Personnel for the project were hired during the first year of the project:

- Kristine Qureshi, Project Director/Principal Investigator
- COL Denise Hopkins-Chadwick, Principal Investigator
- Dr. Judy Carlson, TAMC Nursing Investigator
- Lorrie Wong, Co-Investigator
- Deborah Juarez, Co-Investigator (Health Economist)
- Dale Vincent, Co-Investigator
- Tracie Nagao Bregman, Project manager
- Jonathan Kevan, Graduate Assistant & Curriculum Designer

The project experienced changes in the nursing investigators at TAMC. COL Hopkins-Chadwick was reassigned to the US Army Medical Department Center and School at Fort Sam Houston, in San Antonio Texas, but remained on the project as a second PI. At TAMC MAJ Leilani Siaki was assigned to serve as the TAMC nursing investigator on the project. During August of 2011, MAJ Siaki was deployed to Afghanistan, and a new TAMC nursing investigator, Dr. Judy Carlson was assigned to replace her. Since Dr. Carlson is a civilian employee, she was able to remain on the project through the end.

b. Simulation equipment

All simulation equipment (including two SIM MAN 3G mannequins along with trauma modules) were ordered, delivered, and installed in the first year of the project. Upon installation we found that one mannequin was defective and certain parts (one arm and lungs) were returned and new replacement parts were procured. Manufacturer testing of the two SIM MAN 3G manikins obtained during year 1, resulted in the discovery of additional defects. The defect caused frequent situations where the manikin-computer interface signal would be randomly dropped, which resulted in frequent loss of the signal to the manikin. We were concerned this would negatively impact the training and testing and enter a confounder into the study so we then worked with the Laerdal Company to have the defective parts replaced on both manikins (at no cost to the project). Also during this time (June 2012) Laerdal provided free product upgrades to all customers with SimMan 3Gs due to challenges with reliability of the wireless feature and internal components of the right leg. (A new replacement of an upgraded wireless router and right leg was then required). Arrangements were made to have a Laerdal engineer come to UHM and repair the manikin on August 8th, 2012. These required repairs contributed to some delays in the project.

All investigators underwent training for use of the simulator (3G Sim Man) training from the vendor (Laerdal) and the project graduate student received additional training to become a super user.

Task 2. IRB formal approval (Appendix B)

- a. Phase I Institutional Review board (IRB) Approval: Immediately upon notice of the award, Institutional Review Board (IRB) applications were submitted to UHM on June 15, 2010 and TAMC on July 7, 2010. The UHM IRB application was answered on July 15, 2010 and Phase I was deemed to be exempt. The TAMC IRB application was answered on April 18, 2011, and we were informed that only phase I (which involved no human subjects) was approved, and that once the simulation modules were developed, these protocols, along with all data collection sheets, evaluation tools and consent forms must be submitted and approved before we could pilot test the pilot module.
- b. Phase II IRB approval: A submission for phase two (pilot testing the modules) was submitted to the TAMC (Scientific Review Committee) SRC and IRB on March 6, 2012, and on April 3, 2012 we were informed that the phase II of the study IRB was approved by the TAMC IRB. We then submitted an application to the UHM IRB for approval of phase II April 4, 2012, and were approved on May 4, 2012.
- c. Human Research Protections Office (HRPO): The HRPO application was submitted on May 8, 2012 and an exempt determination and approval was made on June 26, 2012.
- d. Cooperative Research and Development Agreement (CRADA): A CRADA document was submitted on June 25, 2012 and we received a response from the Clinical Investigations Regulatory office (CIRO) on July 7, 2012 that no CRADA was necessary between CIRO and

the University of Hawaii as the contract between US Medical Research and Materiel Command (MRMC) and the University of Hawaii constituted the agreement.

- e. We did not anticipate correctly the amount of time it would take to obtain approvals from: the SRC, IRB, CIRO, HRPO and the CRADA. As a result, we requested a one year no-cost extension to the contract on August 6, 2012. A one year no-cost extension was granted to the project on August 24, 2012.

Task 3. Develop simulation training programs

a. Site Visits to Fort Sam Houston, San Antonio, Texas

- February 24-25, 2011 Site visit by Kristine Qureshi and MAJ Leilani Siaki to Simulation Center at the Defense Medical Readiness Training Institute, Fort Sam Houston, TX.
 - October 12-13, 2011 Site visit by Kristine Qureshi and Judy Carlson to Army Medical Simulation Training Centers at Fort Sam Houston, TX. During this visit we:
 - Developed training module content for the three trauma nursing skills
 - Developed the scenarios for each skill so that they were realistic for both military and civilian nurses
 - Completed development of the demographic data collection sheets previously developed
 - On both site visits we worked with COL Denise L. Hopkins-Chadwick at the Army Medical Department Center and School
- b. Under the recommendation that the research team collaborate with other simulation experts, three investigators and one graduate assistant attended the International Meeting on Simulation in Healthcare (IMSH) conference in New Orleans in January 2011. At this conference they networked and conferred with both military and civilian simulation experts. Following the success of the 2011 IMSH conference, one member from the research team attended the 2012 IMSH conference in San Diego, California and another member attended the 2012 Digital Media and Learning conference in San Francisco, California. In January 2013 two members from the research team attended the 2013 IMSH conference in Orlando, Florida. These events expanded the team's peer network and not only informed them on new simulation practices, but also the latest in PC screen based learning. It was during the first two conferences that we identified the ARTICULATE software program that supported the PCSB simulation training program.
- c. During quarter 6 (10/26/11 - 1/25/12) the software program ARTICULATE was identified and purchased as the program to support development of the PC screen based teaching module for each of the three trauma skills. The program was especially suited for PCSB healthcare training program development as it contained the required tools to assure educational equivalency between the HFS and PCSB training programs. It was estimated that each PCSB training module would require 40-60 hours of curriculum designer work to develop and we expected that the endeavor would be completed by the following quarter.

By April 2012 all three of the PC screen based and high fidelity simulation scenarios, lesson plans, and detailed training tasks were developed (Appendix C and D). The PCSB training modules were loaded onto each of the training computers and tested to ensure smooth and consistent functionality during the testing phase.

Task 5. Develop evaluation strategies

The evaluation model included measurement and analysis of both educational and cost benefit outcomes. Educational outcomes were measured by measuring changes in knowledge, actual hands on skills & critical thinking, and sense of self confidence (KSC) for each trauma nursing skill at the pre, immediate post and six week post training intervals. The assessment tools were designed based on Jeffries Framework for Designing, Implementing and Evaluating Simulations Used as Teaching Strategies in Nursing (Available at: http://livingbooks.nln.org/hits/chapter_03/Jeffries_article_NEP.pdf).

To assess the cost benefit (economics) of each method, input costs were collected, including faculty and staff time spent creating the education content and delivering the intervention, supplies and equipment, and cost for space and utilities. To account for the fact that these initial fixed costs would in reality be spread over more than the 44 students included in the pilot study, we developed an economic model for which we assumed we would be training 416 students per year for each training mode. We assumed 8 students a week would be trained using the PC computers or 8 students using the HFS (4 students each session with 2 sessions per week). We chose a 5-year time horizon for this analysis as that is the expected life of the SimMan mannequin. We assumed the laptops would need to be replaced after 2.5 years. We compared the Net Present Cost (NPC) of each mode of training. This expresses the stream of cash flows occurring over the appraisal period (in this case 5 years) discounted to 2013. NPC calculations consist of the initial investment, development, and implementation costs as well as the steady state costs. Steady state costs are the annual costs incurred in the provision of training after the initial implementation period, including maintenance costs.

(Appendix E provides a copy of each of the evaluation tools used for the model)

Task 6 and 7. Conduct of small pilot test and full scale pilot

- a. Recruitment of research study participants for TAMC commenced on October 15 and was completed on October 24, 2012. Data collection at TAMC occurred from November 12-15, while recruitment for UH participants commenced on November 16 and ended on November 25. Data collection at UH occurred from November 27-30. A 6 week follow up assessment was conducted at TAMC January 10, 11, and 14 and at UH January 15, 22, 23 and 24, 2013. The aforementioned tasks and dates can be seen on the attached Gantt chart representing the no-cost extension (year 3) timeline (Appendix F).

Task 8: Data analysis

- a. During February 2013 the assessment data was cleaned and prepared for statistical analysis. All participant assessment data was then delivered for analysis by Dr. John Chen, a biostatistician from the John A. Burns School of Medicine (JABSOM). Dr. Chen completed his analysis and delivered the data back to the research team during March, 2013.

Final data collection for the economic model including purchases, travel, development effort and training in terms of personnel time was completed and delivered to Dr. Deborah Juarez, the project Health Economist for analysis. Dr. Juarez completed her analysis and delivered the results during July, 2013.

The investigators are in the process of finishing two articles for peer review publication. We intend to submit the articles to Pre-Hospital and Disaster Medicine Clinical Simulation in Nursing. The topic of the first article will focus on the cost benefit analysis model developed and used to compare each type of simulation learning method (PC screen based

vs. HFS); the second article will focus on the comparison in learning outcomes in terms of knowledge, skills and confidence for each trauma nursing skill for each simulation learning method (PC screen based vs. HFS).

KEY RESEARCH ACCOMPLISHMENTS:

Overview:

We developed a model that can be used to compare two different types of simulation supported training, namely PCSB and HFS in terms of learning and cost benefit outcomes. After development of this model we then pilot tested the model by implementing a training program for three trauma nursing skills, namely, cervical spine immobilization, hemorrhage control, and upper airway protection. We tested the models utility for comparing HFS and PCSB simulation supported training in terms of 1. Being able to detect and compare differences in changes in knowledge, actual hands on skills and critical thinking and sense of self confidence (KSC) and 2. Cost analysis outcomes.

Demographics

The pilot phase included 44 registered nurses from the military and civilian sectors (22 active duty military, and 22 civilian). Each participant underwent a pre-test assessment for KSC. To assure for comparability of groups, after the initial baseline assessment, participants were randomly assigned to one of two pilot test simulation supported training groups (PCSB or HFS). We conducted an analysis to assess for comparability between the groups (civilian vs. military nurse participants, as well as overall participants assigned to each training method (PCSB vs. HFS supported training). We found that at baseline, there were no significant differences ($p=.05$) between the civilian and military nurse participants, as well as the HFS and PCSB groups in terms of gender, highest academic degree, experience working in a trauma unit, and total years' experience as a nurse. A large majority of participants in each group were female, held a baccalaureate degree in nursing. Table 1 summarizes and compares demographics between military and civilian as well as PCSB and HFS instruction groups.

Table 1. Demographics of the participants - military and civilian by simulation instruction group

	HF simulation group (HFS)				PCSB simulation group (PCSB)				HF vs. PCSB
	Military n / (%)	Civilian n / (%)	Total HFS n / (%)	p- value	Military n/ (%)	Civilian n/ (%)	Total PCSB n/ (%)	p-value	p-value
Gender				1.00				0.59	1.00
Male	1 (9.1)	2 (18.2)	3 (13.6)		3 (27.3)	1 (9.1)	4 (18.2)		
Female	10 (90.9)	9 (81.8)	19 (86.4)		8 (72.7)	10 (90.9)	18 (81.8)		
Highest Degree				0.087				0.19	0.76
Baccalaureate	8 (72.7)	3 (27.3)	11 (50.0)		9 (81.8)	5 (45.5)	14 (63.6)		
Master's	3 (27.3)	7 (63.6)	10 (45.5)		2 (18.2)	5 (45.5)	7 (31.8)		
	0 (0.0)	1 (9.1)	1 (4.5)		0 (0.0)	1 (9.1)	1 (4.6)		
Ever worked in trauma unit				1.00				1.00	1.00
No	8 (72.7)	9 (81.8)	17 (77.3)		8 (72.7)	8 (72.7)	16 (72.7)		
Yes	3 (27.3)	2 (18.2)	5 (22.7)		3 (27.3)	3 (27.3)	6 (27.3)		
Years of experience as an RN				1.000				0.20	1.00
< 5 years	6 (54.5)	5 (45.5)	11 (50.0)		7 (63.6)	3 (27.3)	10 (45.4)		
≥ 5 years	5 (45.5)	6 (54.5)	11 (50.0)		4 (36.4)	8 (72.7)	12 (54.6)		

Comparison of PCSB vs. HFS supported learning outcomes - methods and findings

The training component of the model was designed to test for changes in learning outcomes in terms of KSC. As noted above, each participant completed pre-testing for KSC for each of the three trauma nursing skills (C-Collar application, CAT tourniquet application and nasal pharyngeal airway insertion), and was then randomly assigned to either the PCSB or HFS group. Each then received the training program for the three trauma nursing skills and completed an immediate KSC posttest, which was repeated again six weeks after the training. We then analyzed the KSC outcomes for changes in scores from the baseline, to the immediate post as well as at the six week post periods. The mean score (and standard deviation) for each of the three trauma nursing skills in terms of KSC was computed, and then compared across the three points in time (pre training, immediate post training and six week post training).

For each of the three trauma nursing skills, knowledge, hands on skills and confidence was measured at three points in time, namely: at the pre training period just before the training, the immediate post-test training period, [which was about one hour after the training], and the post-post training period, [which was six weeks later]).

Knowledge was measured through use of a written test that was answered as true or false. One point was given for each correct answer. For each skill there were four questions (for a total of twelve knowledge questions). The possible range of scores for each skill was 0-4, and to compute a skill score, the number of correct answers for each skill was divided by 4. To compute the total knowledge score, the number of correct answers was divided by 12, the possible range of the total knowledge score was 0-12.

Hands on skills assessment was conducted through the use of critical hands on skills assessment worksheet for each trauma skill. As the scenario unfolded and the participant was asked to perform the skill and the participant was closely observed by the evaluator. The evaluator was blinded as to which method of simulation the participant was trained on. The performance (or lack thereof) of elements for each skill was recorded. For the cervical collar application there were 9 specific elements to be completed, (possible score range was 0-9); for the CAT tourniquet there were 11 critical elements (possible score range was 0-1), and for the nasal pharyngeal airway there were 9 critical elements (possible score range was 0-9).

Confidence scores were assessed through a written self-report questionnaire. For each skill there were 5 confidence questions that the participant scored on a range of 1-4, with 1 representing not at all confident, and 4 representing highly confident.

The training program content was the same for each participant (regardless of the simulation type) to the fullest degree possible. We did not randomize the order of the skills training as it was thought that a difference in the order of the skills training might potentially introduce a confounder and influence the results. Since the aim was to see if there was a difference in learning outcomes between the two different types of simulation supported learning, we strove to keep all training as comparable as possible for each participant.

Knowledge:

In terms of knowledge, overall, we found no significant differences between improvements in knowledge between the HFS or PCSB groups. The mean knowledge score for all three skills combined at the baseline period for the HFS group was 0.64 (SD 0.13), and for the PCSB group it was 0.67 (SD 0.17). At the post-test testing period, the mean score / SD for each group (HFS 0.84 / SD 0.11) and (PCSB 0.81 / SD 0.11) improved significantly ($p < .0001$); at the post-post testing period, there were significant changes that represented a degradation of knowledge for each group. The HFS group knowledge score went from 0.84 at the post-test period to 0.73 (SD 0.14) post-post period six weeks later); and the PCSB

group knowledge score degraded significantly - as the mean scores went from 0.81 at the post-test period to 0.76 (SD 0.11) at the post-post period six weeks later ($p=0.024$). However, overall, there was no difference in overall change in scores between the groups at baseline, post-test and six week post-post testing periods ($p=0.55$; $p=0.16$; $p=0.96$). Table 2. Provides detailed information about each of the trauma nursing skills in terms of the mean scores, standard deviation and p-values for the differences in the scores at each of these periods both within HFS and PCSB and between HFS and PCSB. We then highlight key findings for each specific trauma nursing skill.

Table 2. Trauma nursing scores for knowledge pre, post-test, and six weeks post-post test period

Variable	HFS					PC (Total)					p-value (Baseline HFS vs. PC) [†]	p-value (Difference Baseline – post-test: HFS vs. PC) ^{††}	p-value (Difference Baseline and Post- Post HFS vs. PC) ^{†††}
	Baseline	Post-test	p-value*	Post-Post	p-value**	Baseline	Post-test	p-value*	Post-Post	p-value**			
	mean (sd)	mean (sd)		mean (sd)		mean (sd)	mean (sd)		mean (sd)				
Knowledge													
Cervical Injury (Q1-4) Yes/No													
1. Risk for Cx Injury													
Correct													
Incorrect													
2. Cx collar should be applied													
Correct													
Incorrect													
3. Neurologic symptoms													
Correct													
Incorrect													
4. Removing collar													
Correct													
Incorrect													
Mean score	0.60 (0.15)	0.89 (0.15)	<.0001	0.61 (0.25)	0.86	0.63 (0.17)	0.80 (0.17)	0.0019	0.72 (0.18)	0.089	0.64	0.069	0.069
Mean score change and sd	0.28 (0.18)			0.01 (0.29)		0.17 (0.22)			0.09 (0.24)				
Tourniquet (Q5-8)													
1. Tourniquet preferred													
2. Released q2 minutes													
3. Tourniquet to the leg													
4. Elevating Extremity													
Mean score	0.64 (0.26)	0.85 (0.17)	0.0006	0.82 (0.21)	0.013	0.66 (0.28)	0.82 (0.19)	0.0052	0.76 (0.24)	0.16	0.79	0.45	0.45
Mean score change and sd	0.22 (0.25)			0.18 (0.31)		0.16 (0.24)			0.10 (0.32)				
Nasal Airway (Q9-12)													
1. Beveled end													
2. Unconscious													
3. Preferred method													
4. Suction nasal airway													
Mean Score	0.68 (0.16)	0.78 (0.18)	0.033	0.76 (0.16)	0.11	0.71 (0.21)	0.81 (0.19)	0.059	0.81 (0.17)	0.071	0.58	0.90	0.90
Mean score change and sd	0.10 (0.20)			0.08 (0.22)		0.11 (0.24)			0.11 (0.26)				
Average Score for Knowledge	0.64 (0.13)	0.84 (0.11)	<.0001	0.73 (0.14)	0.024	0.67 (0.17)	0.81 (0.11)	0.0006	0.76 (0.11)	0.024	0.55	0.16	0.96
Mean Change in Avg Score of	0.20 (0.11)			0.09 (0.17)		0.14 (0.16)			0.09 (0.18)				

*Paired ttest comparing differences between baseline and 3 weeks post-test training

**Paired ttest comparing differences between baseline and 6 weeks (post-post) training

†t-test comparing between HFS and PC at Baseline

††t-test comparing change from baseline to 3 weeks post

†††t-test comparing change from baseline to 6 weeks post

- Cervical collar selection and application: For cervical collar application, within groups, both the HFS and PCSB groups had a significant improvement in knowledge from baseline to the post-test period ($p<.0001$; $p=.0019$), and the knowledge scores at the post-post period did not degrade statistically for either group ($p=0.86$; $p=0.089$). When comparing between the HFS and PCSB groups, there was no difference in overall knowledge scores at any point, (baseline $p=0.64$; post-test $p=0.069$ and six week post- post $p=0.069$). Therefore, there is no difference in knowledge improvement for cervical collar application training when comparing HFS with PCSB, both are equally effective.
- CAT tourniquet application: For CAT tourniquet application within groups, both the HFS and PCSB groups had a significant improvement in knowledge from baseline to the post-test period ($p=.0006$; $P=.0052$). The knowledge scores at the post-post period did degrade statistically for the HFS group ($p=0.013$) but did not degrade significantly for the PCSB group ($p=0.16$). When comparing between the HFS and PCSB groups, there was no difference in knowledge scores (baseline $p=0.79$; post-test $p=0.45$ and six week post-post $p=0.45$). Therefore, we conclude that

there is no difference in knowledge improvement when comparing HFS with PCSB, both are equally effective.

- Nasopharyngeal airway insertion: For improvement for knowledge for nasopharyngeal airway insertion we did find differences within the groups. Those in the HFS group had a significant improvement from baseline to post-test testing ($p=0.033$) while those in the PCSB group did not show a statistical improvement in knowledge ($p=0.059$). The knowledge scores at the post-post period did not degrade statistically for either the HFS group ($p=0.11$) or the PCSB group ($p=0.071$). When comparing between the HFS and PCSB groups, there was no difference in knowledge scores (baseline $p=0.58$; post-test $p=0.90$ and six week post-post $p=0.90$).

Hands on trauma nursing skills:

In terms of the hands on trauma nursing skills, the HFS and PCSB groups were equivalent in terms baseline hands on trauma nursing skills. For example, at baseline, the HFS group mean score for all three skills was 0.39 (SD 0.21) while for the PCSB group this score was 0.42 (SD 0.21); when comparing these groups scores, there is no difference between groups ($p=0.74$). Immediately after training the trauma skills mean score increased significantly in both groups, (HFS 0.85, SD 0.05, $p=.0001$; PCSB 0.73, SD 0.15, $p=.0001$). However, when comparing between the groups the HFS group's overall score improved significantly more than the PCSB group (0.46 [SD 0.20] vs. 0.32 [SD 0.23], $p=0.042$). Therefore, while each groups overall score increased significantly from the baseline, the HFS groups score increased more than the PCSB score. Table 3. Provides a summary of the findings for the changes in score for each of the individual trauma skills within the groups and between the groups. A detailed summary for each individual skill then follows.

Table 3. Trauma nursing hands on skills & critical thinking scores at the pre, post-test, and six weeks post-post period

Variable	HFS					PC					p-value (Baseline HFS vs PC) [†]	p-value (Difference Post - Baseline: HFS vs PC) ^{††}	p-value (Difference Post- Post - Baseline: HFS vs PC) ^{†††}
	Baseline	Post-Test	p-value*	Post-Post	p-value**	Baseline	Post-Test	p-value*	Post-Post	p-value**			
	mean (sd)	mean (sd)		mean (sd)		mean (sd)	mean (sd)		mean (sd)				
Cervical Collar Application													
Patient Preparation (Yes/No)													
1. Stabilize head manually													
2. Instruct Pt to continue to remain still													
3. Instruct Pt to Alert Health Providers													
4. Remove jewelry around neck													
Mean score	0.19 (0.20)	0.85 (0.20)	<.0001	0.65 (0.30)	<.0001	0.14 (0.18)	0.53 (0.28)	<.0001	0.41 (0.33)	0.0007	0.34	0.0087	0.060
Mean score change and sd	0.66 (0.29)			0.45 (0.31)			0.40 (0.33)						
Collar Preparation (Yes/No)													
1. Select proper sized collar													
2. Assemble the collar													
Mean score	0.05 (0.15)	0.98 (0.11)	<.0001	0.91 (0.29)	<.0001	0.18 (0.33)	0.84 (0.32)	<.0001	0.84 (0.32)	<.0001	0.087	0.023	0.087
Mean score change and sd	0.93 (0.18)			0.86 (0.32)			0.66 (0.50)						
Procedural Steps (Yes/No)													
1. Return pts head to neutral position													
2. Collar													
3. Assess for accentuation													
Mean score	0.12 (0.30)	0.98 (0.07)	<.0001	0.89 (0.30)	<.0001	0.23 (0.36)	0.71 (0.36)	0.0004	0.79 (0.35)	<.0001	0.30	0.0059	0.089
Mean score change and sd	0.86 (0.30)			0.77 (0.39)			0.48 (0.52)						
CAT Tourniquet Application													
Patient Preparation (Yes/No)													
1. Expose site determine deg of blood loss													
2. Informing Pt applying tourniquet													
Mean score	0.34 (0.32)	0.77 (0.25)	<.0001	0.77 (0.30)	<.0001	0.30 (0.33)	0.68 (0.33)	<.0001	0.50 (0.35)	0.017	0.65	0.67	0.062
Mean score change and sd	0.43 (0.32)			Δ 0.43 (0.42)			0.39 (0.38)						
Assemble Equipment (Yes/No)													
1. Open CAT tourniquet package													
2. Open Velcro													
Mean score	0.64 (0.49)	1.0 (0.0)	0.0024	1.00 (0.00)	0.0024	0.68 (0.39)	0.95 (0.21)	0.0024	0.95 (0.21)	0.0024	0.74	0.50	0.50
Mean score change and sd	0.36 (0.49)			0.36 (0.49)			0.27 (0.37)						
Procedural Steps (Yes/No)													
1. Insert wounded extremity through tourniquet													
2. Pull tourniquet band tight													
3. Twist windlass rod until BRB stopped													
4. Lock in place windlass rod													
5. Adhere band cover over windlass road													
6. Secure tourniquet													
7. Reassess cessation of bleeding													
Mean score	0.47 (0.43)	1.00	<.0001	0.94 (0.20)	<.0001	0.38 (0.40)	0.90 (0.24)	<.0001	0.86 (0.25)	<.0001	0.48	0.92	0.92
Mean score change and sd	0.53 (0.43)			0.47 (0.44)			0.52 (0.40)						
Nasal Airway Insertion													
Patient Preparation (Yes/No)													
1. Place Pt in supine position or high fowlers													
2. ID largest nostril, assess for FB, SD, polyps													
Mean score	0.43 (0.39)	0.98 (0.11)	<.0001	1.00 (0.00)	<.0001	0.50 (0.38)	0.77 (0.30)	0.02	1.00 (0.00)	<.0001	0.56	0.056	0.56
Score Change (mean change and sd)	0.55 (0.41)			0.57 (0.39)			0.27 (0.50)						
Assemble Equipment (Yes/No)													
1. Water soluble lubricant													
2. Suction equipment													
3. Selecting correct sized NP airway													
Mean score	0.64 (0.41)	0.95 (0.12)	0.0030	0.92 (0.25)	0.0039	0.64 (0.31)	0.86 (0.22)	0.0078	0.98 (0.07)	<.0001	1.00	0.46	0.59
Mean score change and sd	0.32 (0.44)			0.29 (0.42)			0.23 (0.36)						
Procedural Steps (Yes/No)													
1. Lubricate tube with water-soluble agent													
2. Passing airway													
3. If resistance is met													
4. Assess for patency													
Mean score	0.67 (0.4)	0.99 (0.05)	0.0024	0.98 (0.07)	0.0018	0.70 (0.34)	0.84 (0.25)	0.18	0.98 (0.07)	0.0011	0.77	0.19	0.77
Mean score change and sd	0.32 (0.43)			0.31 (0.40)			0.14 (0.45)						
Average of Total Score for Skill Assessment													
Change in Avg Total Score for Skill	0.39 (0.21)	0.85 (0.05)	<.0001	0.90 (0.14)	<.0001	0.42 (0.21)	0.73 (0.15)	<.0001	0.81 (0.14)	<.0001	0.74	0.042	0.064
	0.46 (0.20)			0.50 (0.16)			0.32 (0.23)						

*Paired ttest comparing differences between baseline and 3 weeks post-test training

**Paired ttest comparing differences between baseline and 6 weeks (post-post) training

†t-test comparing between HFS and PC at Baseline

††t-test comparing change from baseline to 3 weeks post between HFS and PC

†††t-test comparing change from baseline to 6 weeks post between HFS and PC

- Cervical collar (C-collar) selection and application: For cervical collar application, there was no significant difference in hands on C-collar skill scores between the HFS and PCSB groups at baseline ($p=0.30$). Within each group both the HFS and PCSB groups had a significant improvement in hands on skills for C-collar application from baseline to the post-test period ($p<.0001$; $P=.0004$), and for the C-collar skill scores at the post-post period, there was a statistically significant degradation of the scores for both groups ($p=0.0001$; $p=0.0001$). However, when comparing between the groups for the HFS vs. PCSB scores at the post-test period, the HFS group mean score increased more than the PCSB group mean score (HFS mean score change was .086 (SD 0.30), while the PCSB score change was 0.48 (SD 0.52). However, each group had a significant improvement in their skill scores from baseline to post-test and baseline to post-post periods for cervical collar application.
- CAT tourniquet application: For CAT tourniquet application, there was no significant difference in hands on skill scores between the HFS and PCSB groups at baseline ($p=0.48$). Within each group both the HFS and PCSB groups had a significant improvement in hands on skills for CAT tourniquet application from baseline to the post-test period ($p<.0001$; $P=.0001$), and for the CAT tourniquet skill scores at the post-post period, there was a statistically significant degradation of the scores for both groups ($p=0.0001$; $p=0.0001$). When comparing between the groups for the HFS vs. PCSB scores at the post-test period, there was no difference in improvement in the scores between groups at any point (baseline $p=0.48$; post-test $p=0.92$; post- post test $p=0.92$). Each group had a significant improvement in their skill scores from baseline to post-test and baseline to post-post periods for CAT tourniquet application.
- Nasopharyngeal airway insertion (NAI): For NAI, there was no significant difference in hands on skill scores between the HFS and PCSB groups at baseline ($p=0.77$). When examining changes within each group, we found that the HFS group improved their scores significantly from baseline to the post-test period (baseline score 0.64 (SD 0.4), post-test score 0.99 (SD 0.5), improvement of 0.32, $p=0.0024$). There was no significant change in the score at the post-post test period. However, the PCSB group did not significantly improve their score for NAI from baseline to the post-test period, but the group started with a high baseline. (Baseline score 0.70 (SD 0.4), post-test score 0.84 (SD 0.25), improvement of 0.14, $p=0.18$). At the post-post period, the PCSB groups NAI score significantly changed, (it actually improved) from the post-test score. It went from a mean score of 0.84 (SD 0.25), to 0.98 (SD 0.07). When comparing the post-post score with the baseline score for NAI within the PCSB group, there was a statistically significant score improvement ($p=0.0011$). When comparing between the groups for the HFS vs. PCSB scores at the post-test period, there was no difference in improvement in the scores between the groups at any point (baseline $p=0.77$; post-test $p=0.19$ post-post test $p=0.77$). Each group had a significant improvement in their skill scores for NAI from baseline to the post-post period.

Confidence:

In terms of confidence, we found no significant differences between improvements in confidence between the HFS or PCSB groups. The mean confidence score for all three skills combined at the baseline period for the HFS group was 2.35 (SD 0.69), and for the PCSB group it was 2.33 (SD 0.71). At the post-test testing period, the mean score / SD for each group improved significantly (HFS 3.46 / SD 0.38) and (PCSB 3.48 / SD 0.48) ($p<.0001$; $p<.0001$); at the post-post testing period, there were significant changes that represented a degradation of confidence for each group. The HFS group confidence score decreased to 3.24 (SD 0.40), and the PCSB group confidence score degraded significantly to 3.00 (SD 0.51), ($p<.0001$; $p<.0001$). Table 4. Provides detailed information about each of the trauma nursing skills in terms of the mean scores, standard deviation and p-values for the differences in the scores at each of these periods both within HFS and PCSB and between HFS and PCSB.

Table 4. Trauma nursing scores for confidence for performing the skills at the pre, immediate post-test, and six weeks post-post period

Variable	HFS					PC (Total)					p-value (Baseline HFS vs PC) [†]	p-value (Difference Post-Baseline: HFS vs PC) ^{††}	p-value (Difference Post-Post - Baseline: HFS vs PC) ^{†††}
	Baseline	Post-test	p-value*	Post-Post	p-value**	Baseline	Post-test	p-value*	Post-Post	p-value**			
	mean (sd)	mean (sd)		mean (sd)		mean (sd)	mean (sd)		mean (sd)				
Confidence													
Spine Immobilization													
1. Recognize need to immobilize													
2. Recognize contraindications													
3. Selecting correct size of Cx Collar													
4. Correctly apply collar on patient													
5. Recognize indications													
Mean score	2.07 (0.72)	3.35 (0.44)	<.0001	3.01 (0.45)	<.0001	2.25 (0.78)	3.35 (0.53)	<.0001	2.92 (0.49)	<.0001	0.45	0.43	0.43
Mean score change and sd		1.28 (0.73)				0.94 (0.77)			1.10 (0.75)				
Acute Hemorrhage													
1. Recognize acute hemorrhage situation													
2. Correct select pressure dressing vs tourniquet													
3. Correctly apply tourniquet in 15s													
4. Accurately assess effectiveness													
5. Evaluate risk vs. benefits													
Mean score	2.34 (0.76)	3.50 (0.37)	<.0001	3.40(0.47)	<.0001	2.39 (0.72)	3.49 (0.51)	<.0001	3.06 (0.51)	<.0001	0.81	0.76	0.76
Mean score change and sd		1.16 (0.69)				1.06 (0.72)			1.10 (0.70)				
Upper Airway Protection													
1. Recognize S/S of risk to airway patency													
2. Recognize need to protect airway													
3. Select correct size device													
4. Correct insert nasal airway													
5. Recognize indications for ceasing insertion													
Mean score	2.62 (0.82)	3.53 (0.43)	<.0001	3.33 (0.49)	0.0004	2.38 (0.76)	3.48 (0.48)	<.0001	3.01 (0.65)	<.0001	0.32	0.46	0.53
Mean score change and sd		0.91 (0.77)				0.71 (0.77)			1.08 (0.69)				
Average Score for Confidence	2.35 (0.69)	3.46 (0.38)	<.0001	3.24 (0.40)	<.0001	2.33 (0.71)	3.44 (0.48)	<.0001	3.00 (0.51)	<.0001	0.94	0.97	0.20
Change in Avg Score of Confidence		1.12 (0.66)				0.90 (0.68)			1.11 (0.64)				

*Paired t-test comparing differences between baseline and 3 weeks post-test training

**Paired t-test comparing differences between baseline and 6 weeks (post-post) training

†t-test comparing between HFS and PC at Baseline

††t-test comparing change from baseline to 3 weeks post

†††t-test comparing change from baseline to 6 weeks post

Cost benefit analysis

A cost benefit analysis was then conducted. To assess the economics of each method, input costs were collected, including faculty and staff time spent creating the education content and delivering the intervention, supplies and equipment, and cost for space and utilities. HFS requires a large initial investment in terms of equipment purchases. Moreover, initial development of the training modules represents another large initial cost. To account for the fact that these initial fixed costs would in reality be spread over more than the 44 students included in the pilot study, we developed an economic model for which we assumed we would be training 416 students per year for each training mode. We assumed 8 students a week would be trained using the PC computers or 8 students using the HFS (4 students each session with 2 sessions per week). We chose a 5-year time horizon for this analysis as that is the expected life of the SimMan mannequin. We assumed the laptops would need to be replaced after 2.5 years.

Because there were no significant differences in learning outcomes from the two modes of training, we conducted a cost minimization analysis. In particular, we compared the Net Present Cost (NPC) of each mode of training. This expresses the stream of cash flows occurring over the appraisal period (in this case 5 years) discounted to 2013. NPC calculations consist of the initial investment, development, and implementation costs as well as the steady state costs. Steady state costs are the annual costs incurred in the provision of training after the initial implementation period, including maintenance costs.

$$Net\ Present\ Cost = \sum_{t=0}^n \frac{(Cost)_t}{(1+r)^t}$$

where t= time in terms of years into the future

r = discount rate

n= number of years

All future costs are discounted at 3% to reflect positive time preference, in that we tend to place a greater value on things if we can have them now rather than in the future and, similarly, costs seem less of a constraint if we have to pay for them in the future. The discount rate was set at 3% as that rate was recommended by U.S. Public Health Service panel on cost effectiveness in health and medicine in 1996.

The cost analysis between the two types of training (PCSB vs. HFS) were startling. HF simulation training costs \$410 per session for eight students, while the PCSB training costs \$55 per session for eight students. Therefore, HF simulation is about 7.5 times more costly per session of training for six students compared to PCSB, but the learning outcomes (in terms of knowledge, psychomotor skills, confidence and critical thinking ability) are statistically the same between both simulation types among both groups of nurses (military and civilian).

REPORTABLE OUTCOMES:

In April 2012 a poster presentation titled: "Creating an evaluation model for simulation learning" was presented at the Phyllis J. Verhonick Nursing Research Course, in San Antonio, TX. by COL Denise Hopkins-Chadwick (Appendix G). The citation for the project did not contain all required information. The PI was made aware that the acknowledgements to the poster were incorrect and retrained the investigators on the project as to the correct citation to be used.

On March 21, 2013 a presentation was given by Dr. Kristine Qureshi and Dr. Judy Carlson at the Pacific Institute of Nursing Conference (PIN). Concurrent session 2 - Community Health: "Model Development to Compare Different Types of Simulation Based Learning for Trauma Nursing Skills Among Military & Civilian Nurses" (Appendix H)

In September 2013 a poster presentation titled: "A Comparison of PC Screen-based vs. High Fidelity Simulation Supported Instruction for Trauma Nursing Skills in Terms of Learning and Cost" was presented at the 7th Asia Pacific Emergency and Disaster Nursing Network Meeting in Bangkok, Thailand. (Appendix I).

Two manuscripts for peer review publication are in progress and both are 75% complete. The first article reports on the findings relative to use of the model to compare learning outcomes between PC screen based and high fidelity simulation based instruction, and the second article under development reports on the use of the model to compare cost outcomes.

CONCLUSION/ DISCUSSION:

Using the model developed and then piloted, we found that both types of simulation supported learning (HF and PCSB) were both effective for increasing KSA for the three trauma nursing skills. Furthermore, there was no significant difference in learning outcomes between the two simulation methods - both groups had a significant increase in KSA when measured from the baseline to the immediate post training testing, and for most skills there was a slight degradation of knowledge at the six week post training period, but the KSA level that remained was still significantly higher than the baseline level of KSA. With regards to cost outcomes, we did however find a very significant different in cost between the two simulation methods. HF simulation costs were calculated to be \$410 per session, while PCSB costs were \$55 per session. HF simulation supported instruction is much more costly compared to PCSB supported instruction, yet for trauma nursing skills of relatively low complexity, the learning outcomes were essentially the same when comparing the two methods.

It should be noted that there are several important factors to consider in light of these findings. First, the focus of this project was to develop and then pilot test a model that could be used to measure differences in outcomes (KSA and cost) for different methods of simulation supported learning. Since

this was a pilot to test the model, the sample size was quite small and this may have influenced the findings. Also, it is important to note that this model was tested using relatively simple trauma nursing skills (cervical spine immobilization, CAT tourniquet application and nasopharyngeal airway insertion). The success of the PCSB learning may not be as evident with more complex trauma skills that require a large amount of healthcare worker team communication and collaboration (which were not included to a significant degree in the scenarios). Therefore the model needs to be tested with a larger sample, and also with a more complex set of skills that includes communication, collaboration and teamwork.

Despite these limitations, the findings from this project highlight the fact that the level of simulation used should probably be matched to the complexity of the skill at hand. It is likely that a relatively simple, straightforward healthcare worker skill does not require a sixty thousand dollar mannequin that requires an information technology technician and a faculty member to be in attendance. The next phase of this inquiry is to identify what level of simulation is best for more complex trauma skills.

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SUPPORTING DATA:

Not applicable

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ACRONYMS

CIRO	Clinical Investigations Regulatory Office
CRADA	Cooperative Research and Development Agreement
DoD	Department of Defense
HF	High-fidelity simulation
HRPO	Human Research Protections Office
IMSH	International Medical Simulation Society
IRB	Institutional Review Board
JABSOM	John A. Burns School of Medicine
KSC	Knowledge, skills and sense of self confidence
NAI	Nasopharyngeal airway insertion
NPC	Net Present Cost
PCSB	PC screen-based
PI	Principal Investigator
PIN	Pacific Institute of Nursing
TAMC	Tripler Army Medical Center
TAMC SRC	Tripler Army Medical Center, Scientific Review Committee
UHM	University of Hawaii at Manoa
USAMRMC	United States Army Medical Research and Materiel Command

Appendices

- Appendix A: Simulation learning PC screen-based vs. high fidelity – progress chart
- Appendix B: Approved Protocol – Simulation Learning: PC-Screen Based (PCSB) versus High Fidelity Simulation (HFS) Part II Model Development
- Appendix C: PC-Screen Based and High Fidelity Simulation Scenarios and detailed training task for each skill
- Appendix D: Lesson plans for each training module
- Appendix E: Evaluation model
- Appendix F: Simulation learning PC screen-based vs. high-fidelity – No cost extension progress chart
- Appendix G: Abstract and poster “Creating an Evaluation Model for Simulation Learning”
- Appendix H: Presentation "Model Development to Compare Different Types of Simulation Based Learning for Trauma Nursing Skills Among Military & Civilian Nurses"
- Appendix I: Presentation "A Comparison of PC Screen-based vs. High Fidelity Simulation Supported Instruction for Trauma Nursing Skills in Terms of Learning and Cost"
- Appendix J: Participant Demographics
- Appendix K.1: Confidence, Knowledge, and Skills
- Appendix K.2: Confidence, Knowledge, and Skills

QTR	Task Name	% Comp	Proposed Start Date	Proposed End Date
1	Organize the project	100%	Mon 7/26/10	Mon 10/25/10
	- Schedule monthly meetings at each site & between sites	100%	Mon 7/26/10	Mon 10/25/10
	- Hire support personnel and procure equipment	100%	Mon 7/26/10	Mon 10/25/10
2	Begin IRB formal approval	100%	Mon 7/26/10	Mon 10/25/10
	- Develop and submit IRB approval documents for UH and TAMC	100%	Mon 7/26/10	Mon 10/25/10
2	Develop simulation training programs	100%	Tue 10/26/10	Tue 1/25/11
	- Identify existing program, develop and pilot test comparison program for alternative simulation method	100%	Tue 10/26/10	Tue 1/25/11
	- Site visit to USAMRMC Frederick, MD Simulation Center	100%	Tue 10/26/10	Tue 1/25/11
3	Develop evaluation strategies (use what was learned at SC to shape the training and evaluation materials)	100%	Wed 1/26/11	Mon 4/25/11
	- Educational effectiveness	100%	Wed 1/26/11	Mon 4/25/11
	- Cost benefit analysis	100%	Wed 1/26/11	Mon 4/25/11
4	Small pilot test learning modules and evaluation & economic model (N=4), & revise as needed	100%	Tue 4/26/11	Mon 7/25/11

Project: Simulation Learning PC Screen-Based vs. High Fidelity Project - Progress Chart
Date: Thu 8/22/13

Task work in progress Task work completed

Page 1

QTR	Task Name	% Comp	Proposed Start Date	Proposed End Date	July 1 6/13/25	October 1 9/5/25	January 1 10/1/25	April 1 1/9/26	July 1 4/3/26	October 1 5/15/26	January 1 6/26/26	April 1 8/7/26	July 1 9/18/26	October 1 10/30/26	January 1 12/11/27	April 1 3/4/28	July 1 4/15/28	October 1 5/27/28	January 1 7/8/29	April 1 8/19/30	July 1 10/1/31	October 1 11/2/31	January 1 2/3/32	April 1 3/17/32	July 1 4/28/32	October 1 6/9/32	January 1 7/21/32	April 1 9/1/32	July 1 10/1/32	October 1 11/2/32	January 1 2/3/33	April 1 3/17/33	July 1 4/28/33	October 1 6/9/33	January 1 7/21/33	April 1 9/1/33	July 1 10/1/33	October 1 11/2/33	January 1 2/3/34	April 1 3/17/34	July 1 4/28/34	October 1 6/9/34	January 1 7/21/34	April 1 9/1/34	July 1 10/1/34	October 1 11/2/34	January 1 2/3/35	April 1 3/17/35	July 1 4/28/35	October 1 6/9/35	January 1 7/21/35	April 1 9/1/35	July 1 10/1/35	October 1 11/2/35	January 1 2/3/36	April 1 3/17/36	July 1 4/28/36	October 1 6/9/36	January 1 7/21/36	April 1 9/1/36	July 1 10/1/36	October 1 11/2/36	January 1 2/3/37	April 1 3/17/37	July 1 4/28/37	October 1 6/9/37	January 1 7/21/37	April 1 9/1/37	July 1 10/1/37	October 1 11/2/37	January 1 2/3/38	April 1 3/17/38	July 1 4/28/38	October 1 6/9/38	January 1 7/21/38	April 1 9/1/38	July 1 10/1/38	October 1 11/2/38	January 1 2/3/39	April 1 3/17/39	July 1 4/28/39	October 1 6/9/39	January 1 7/21/39	April 1 9/1/39	July 1 10/1/39	October 1 11/2/39	January 1 2/3/40	April 1 3/17/40	July 1 4/28/40	October 1 6/9/40	January 1 7/21/40	April 1 9/1/40	July 1 10/1/40	October 1 11/2/40	January 1 2/3/41	April 1 3/17/41	July 1 4/28/41	October 1 6/9/41	January 1 7/21/41	April 1 9/1/41	July 1 10/1/41	October 1 11/2/41	January 1 2/3/42	April 1 3/17/42	July 1 4/28/42	October 1 6/9/42	January 1 7/21/42	April 1 9/1/42	July 1 10/1/42	October 1 11/2/42	January 1 2/3/43	April 1 3/17/43	July 1 4/28/43	October 1 6/9/43	January 1 7/21/43	April 1 9/1/43	July 1 10/1/43	October 1 11/2/43	January 1 2/3/44	April 1 3/17/44	July 1 4/28/44	October 1 6/9/44	January 1 7/21/44	April 1 9/1/44	July 1 10/1/44	October 1 11/2/44	January 1 2/3/45	April 1 3/17/45	July 1 4/28/45	October 1 6/9/45	January 1 7/21/45	April 1 9/1/45	July 1 10/1/45	October 1 11/2/45	January 1 2/3/46	April 1 3/17/46	July 1 4/28/46	October 1 6/9/46	January 1 7/21/46	April 1 9/1/46	July 1 10/1/46	October 1 11/2/46	January 1 2/3/47	April 1 3/17/47	July 1 4/28/47	October 1 6/9/47	January 1 7/21/47	April 1 9/1/47	July 1 10/1/47	October 1 11/2/47	January 1 2/3/48	April 1 3/17/48	July 1 4/28/48	October 1 6/9/48	January 1 7/21/48	April 1 9/1/48	July 1 10/1/48	October 1 11/2/48	January 1 2/3/49	April 1 3/17/49	July 1 4/28/49	October 1 6/9/49	January 1 7/21/49	April 1 9/1/49	July 1 10/1/49	October 1 11/2/49	January 1 2/3/50	April 1 3/17/50	July 1 4/28/50	October 1 6/9/50	January 1 7/21/50	April 1 9/1/50	July 1 10/1/50	October 1 11/2/50	January 1 2/3/51	April 1 3/17/51	July 1 4/28/51	October 1 6/9/51	January 1 7/21/51	April 1 9/1/51	July 1 10/1/51	October 1 11/2/51	January 1 2/3/52	April 1 3/17/52	July 1 4/28/52	October 1 6/9/52	January 1 7/21/52	April 1 9/1/52	July 1 10/1/52	October 1 11/2/52	January 1 2/3/53	April 1 3/17/53	July 1 4/28/53	October 1 6/9/53	January 1 7/21/53	April 1 9/1/53	July 1 10/1/53	October 1 11/2/53	January 1 2/3/54	April 1 3/17/54	July 1 4/28/54	October 1 6/9/54	January 1 7/21/54	April 1 9/1/54	July 1 10/1/54	October 1 11/2/54	January 1 2/3/55	April 1 3/17/55	July 1 4/28/55	October 1 6/9/55	January 1 7/21/55	April 1 9/1/55	July 1 10/1/55	October 1 11/2/55	January 1 2/3/56	April 1 3/17/56	July 1 4/28/56	October 1 6/9/56	January 1 7/21/56	April 1 9/1/56	July 1 10/1/56	October 1 11/2/56	January 1 2/3/57	April 1 3/17/57	July 1 4/28/57	October 1 6/9/57	January 1 7/21/57	April 1 9/1/57	July 1 10/1/57	October 1 11/2/57	January 1 2/3/58	April 1 3/17/58	July 1 4/28/58	October 1 6/9/58	January 1 7/21/58	April 1 9/1/58	July 1 10/1/58	October 1 11/2/58	January 1 2/3/59	April 1 3/17/59	July 1 4/28/59	October 1 6/9/59	January 1 7/21/59	April 1 9/1/59	July 1 10/1/59	October 1 11/2/59	January 1 2/3/60	April
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Appendix B. Approved Protocol – Simulation Learning: PC-Screen Based (PCSB) versus High Fidelity Simulation (HFS) Part II Model Development



UNIVERSITY
of HAWAII
MĀNOA

Office of Research Compliance
Human Studies Program

May 4, 2012

TO: Kristine Qureshi, RN
Principal Investigator
Nursing

FROM: Ching Yuan Hu, PhD
Interim Director
Human Studies Program
Office of Research Compliance
University of Hawaii, Manoa

A handwritten signature in black ink, appearing to be "C. Hu", written over the printed name of Ching Yuan Hu.

Re: CHS #20151- "Simulation Learning: PC- Screen Based (PCSB) Versus High Fidelity Simulation (HFS) Part II Model Development"

This letter is your record of the Human Studies Program approval of this study as exempt.

On May 4, 2012, the University of Hawai'i (UH) Human Studies Program approved this study as exempt from federal regulations pertaining to the protection of human research participants. The authority for the exemption applicable to your study is documented in the Code of Federal Regulations at 45 CFR 46 (2).

Exempt studies are subject to the ethical principles articulated in The Belmont Report, found at <http://www.hawaii.edu/irb/html/manual/appendices/A/belmont.html>

Exempt studies do not require regular continuing review by the Human Studies Program. However, if you propose to modify your study, you must receive approval from the Human Studies Program prior to implementing any changes. You can submit your proposed changes via email at uhirb@hawaii.edu. (The subject line should read: Exempt Study Modification.) The Human Studies Program may review the exempt status at that time and request an application for approval as non-exempt research.

In order to protect the confidentiality of research participants, we encourage you to destroy private information which can be linked to the identities of individuals as soon as it is reasonable to do so. Signed consent forms, as applicable to your study, should be maintained for at least the duration of your project.

This approval does not expire. However, please notify the Human Studies Program when your study is complete. Upon notification, we will close our files pertaining to your study.

If you have any questions relating to the protection of human research participants, please contact the Human Studies Program at 956-5007 or uhirb@hawaii.edu. We wish you success in carrying out your research project.

1960 East-West Road
Biomedical Sciences Building B104
Honolulu, Hawai'i 96822
Telephone: (808) 956-5007
Fax: (808) 956-8683

An Equal Opportunity/Affirmative Action Institution

3 April 2012

MEMORANDUM FOR Judy Carlson, RN, Ed.D. Department of Nursing,
(ATTN: MCHK-NS), Tripler AMC, HI

SUBJECT: Approval to Initiate No Greater Than Minimal Risk Study

1. Your clinical investigation protocol entitled "Simulation Learning: PC-Screen Based (PCSB) versus High Fidelity Simulation (HFS) Part 2 Model Development" was reviewed and approved through expedited review procedures as No Greater Than Minimal Risk under provisions of 32CFR219.110 by the Chair of the Institutional Review Board (IRB) at Tripler Army Medical Center (TAMC) on 2 April 2012. The protocol is approved for a period of 3 April 2012 through 2 April 2013. The study has been assigned **TAMC Protocol Number 31H12**. You may only begin research work related to this protocol that is not dependent upon a Cooperative Research and Development Agreement/Statement of Work (CRADA/SOW). For the research activity that is CRADA/SOW dependent, a separate CRADA/SOW approval letter is required prior to commencement.
2. The protocol will expire on 2 April 2013 and must be re-approved by the IRB before that date. You will be notified to submit a Continuing Review Report for your study through IRBNet using the DMRN Continuing Review Report. The Continuing Review Report will serve as an application for re-approval by the IRB, and so must be turned in no later than 6 weeks before the date of expiration.
3. You are approved to enroll **up to 44** subjects into the study. You may not exceed this number without *prior* approval. Subjects that enroll but withdraw from participation are considered in the total number of subjects. The official informed consent documents and HIPAA authorization for use in this study are enclosed and affixed with the TAMC IRB stamp dated 3 April 2012 with the expiration date 2 April 2013 for duplication and enrollment of study subjects.
4. The principal investigator must *promptly* report any serious or unexpected adverse reactions to drugs or procedures to the IRB. Any study-related serious unexpected adverse events must be reported to the Chief, Department of Clinical Investigation (DCI), Human Protections Administrator, and to the Chair, Human Use Committee **within 24 hours** after the investigator becomes aware of the event. The initial report should be followed by a full written report to the DCI Research Review Office no later than 10 business days after the investigator becomes aware of the event. 21 CFR 312.32 defines a serious adverse event or suspected adverse reaction as one that results in: (a) death, (b) persistent or significant disability or incapacity, (c) life-threatening situation, (d) inpatient or prolonged hospitalization, or (e) congenital anomaly/birth defect in an offspring, or (f) an important medical event that, based upon appropriate medical judgment may jeopardize the patient or participant and may require medical or surgical intervention to prevent one of the outcomes listed above.

You should retain this letter as part of this protocol's record.

MCHK-CI

SUBJECT: Approval of Study Initiation

5. Approval is granted with the understanding that no further changes or additions will be made to the procedures followed, investigators involved, or to the informed consent document(s) used without the knowledge and approval of the IRB. Changes include, but not limited to, modifications in study design, recruitment process and number of subjects.
6. You are required to keep all signed subject informed consent documents in a permanent file in an area designated for that purpose that is accessible to your chain of command and inspectors of official audit agencies. Your study and its documentation, including the executed informed consent documents, are subject to inspection at any time. You must maintain your records to facilitate such inspections. Upon completion of the study, you should report this to the Department of Clinical Investigation.
7. Please note that this is *not* an approval to receive extramural resources (i.e., personnel, drugs, supplies, equipment, money, and gifts from any source outside of TAMC) nor an indication of guaranteed funding from the Department of Clinical Investigation. You must coordinate extramural resource approvals with the Department of Clinical Investigation, Bldg. 40, 433-6709. If any extramural resources are received without DA or MEDCOM approval, the individual who receives them may be found in ethics violation and prosecuted for criminal misconduct.
8. All manuscripts, abstracts, or publicly-released information related to research conducted at or sponsored by TAMC must be submitted for approval as stated in TAMC Pamphlet 40-31 *prior* to submission for public release or publication. This includes oral presentations or posters, manuscripts, review articles, case reports, abstracts and interviews.
9. Your research study has been determined to be of potential importance to the academic and professional program of Tripler AMC. You are to give all possible priority to its completion. Should any problem arise that jeopardizes the success of your research, please notify the undersigned at 433-7171.

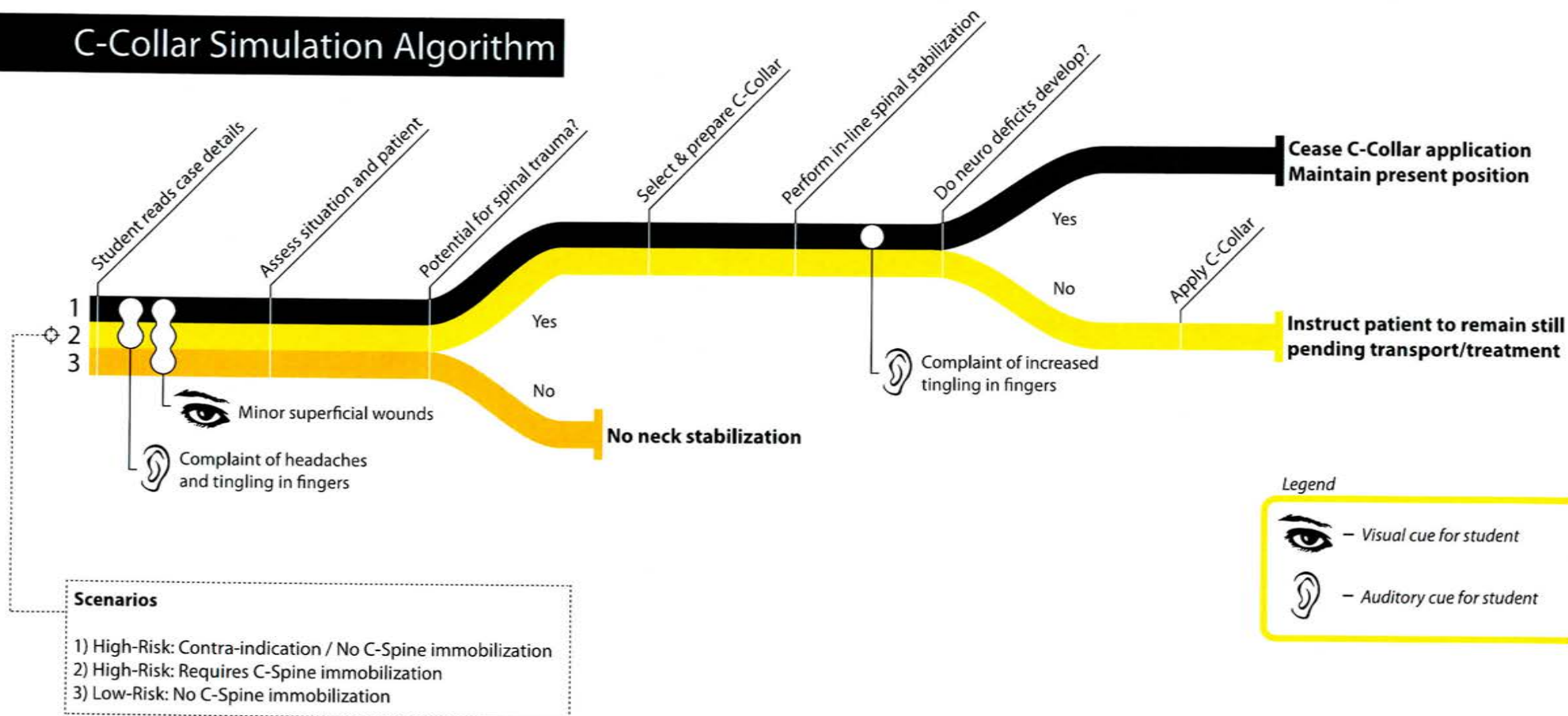
Encl



KEVIN M. LIN-HURTUBISE, M.D.
Chair, Institutional Review Board

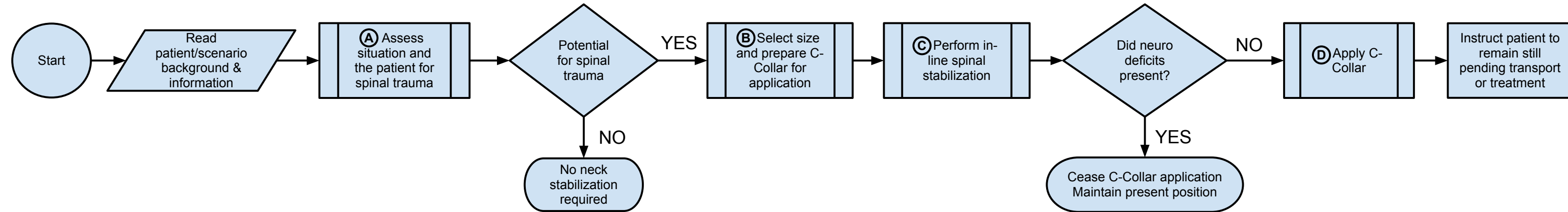
You should retain this letter as part of this protocol's record.

C-Collar Simulation Algorithm



Scenario A - Spinal stabilization: Sub processes

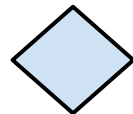
Two Person C-Collar simulation algorithm Pathway A



Legend: Pathway Points



Complex task to be performed by learner



Decision point. Typically true/false type questions



Information given to learner (written, oral, visual)



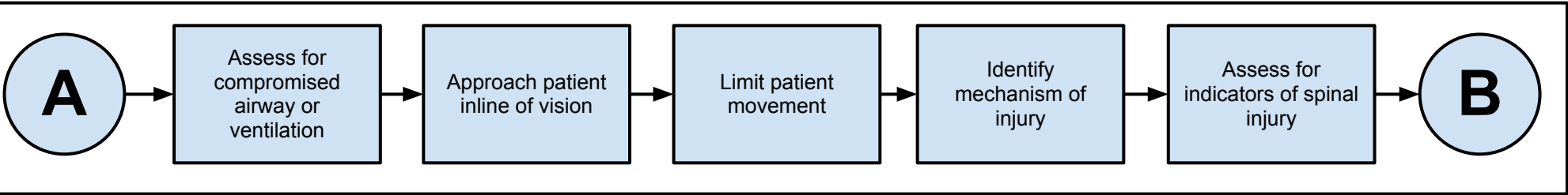
Simple or sub-task to be performed by learner



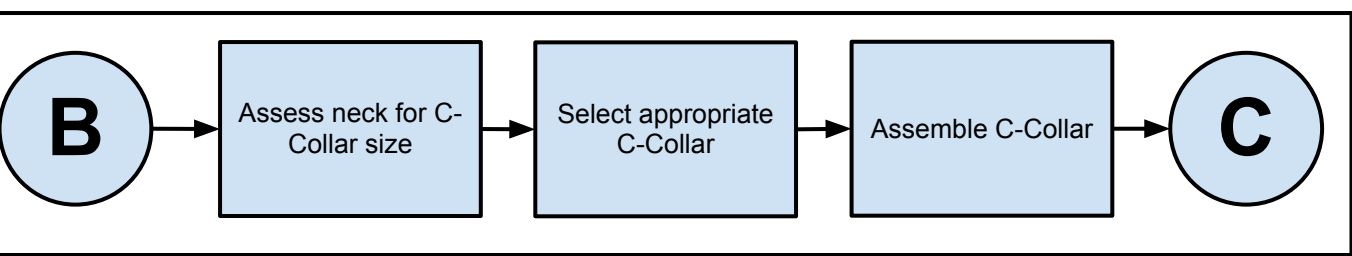
Terminator, end of algorithm.

Scenario A - Spinal stabilization: Sub processes

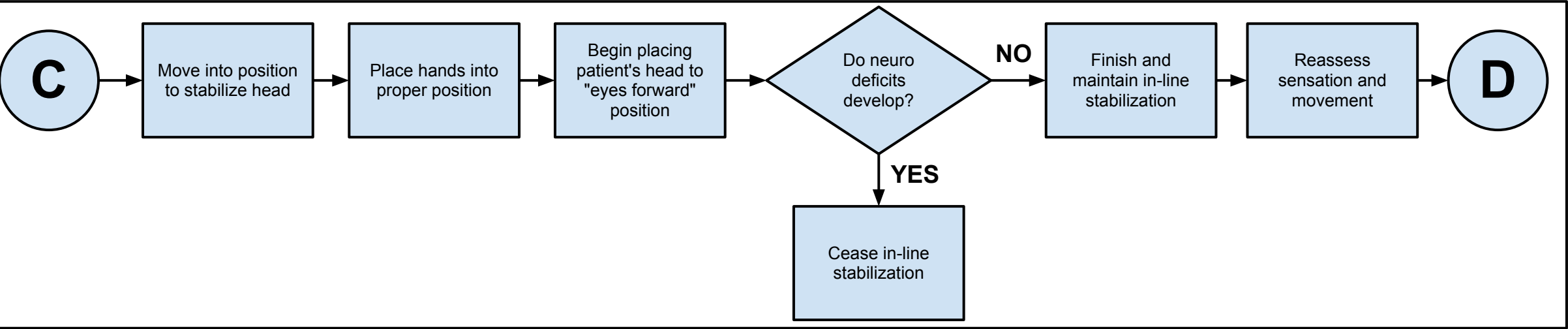
Assess situation and the patient for spinal trauma



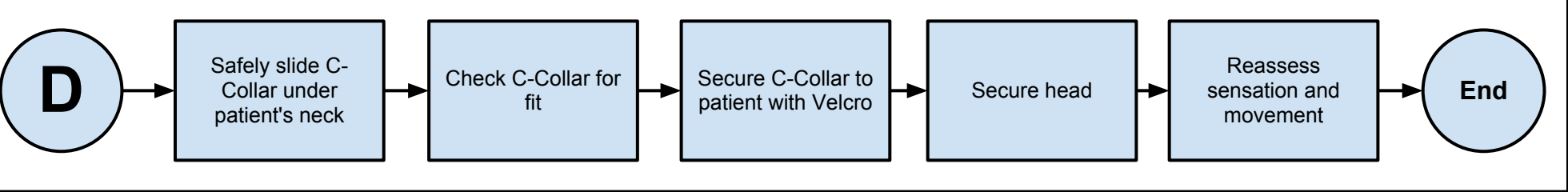
Select size and prepare C-Collar for application



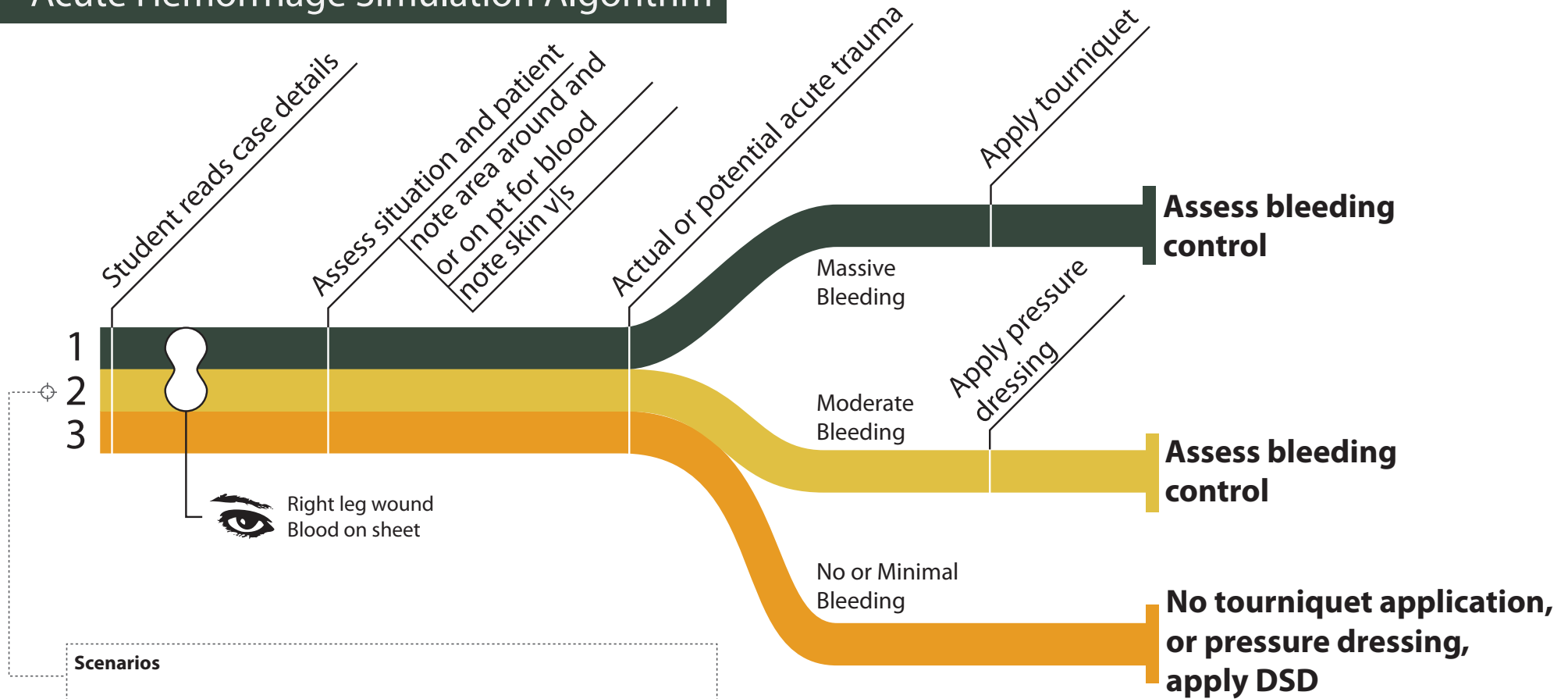
Perform in-line spinal stabilization



Apply C-Collar



Acute Hemorrhage Simulation Algorithm



Legend



– Visual cue for student



– Auditory cue for student

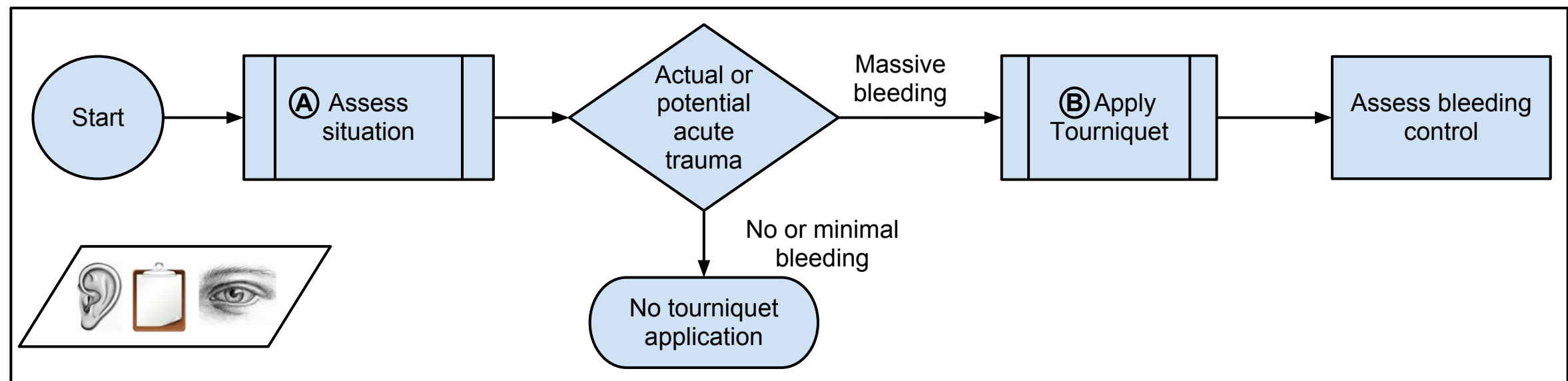


School of Nursing and Dental Hygiene

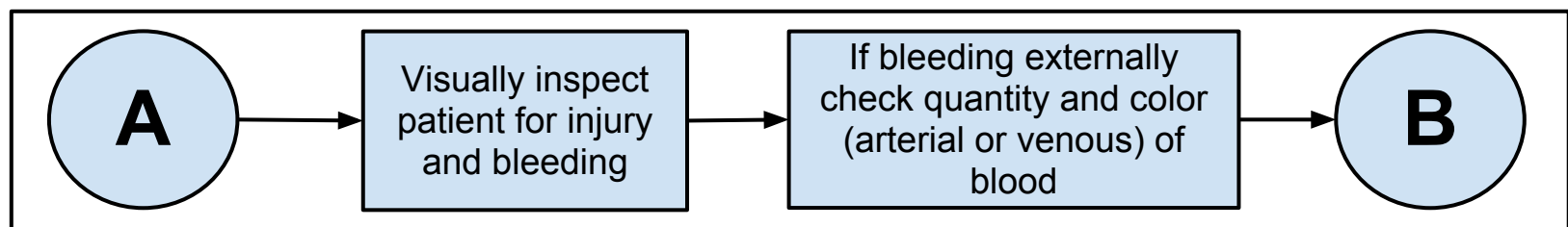
University of Hawai'i at Mānoa

Scenario B - Circulation: Acute Hemorrhage Simulation Algorithm

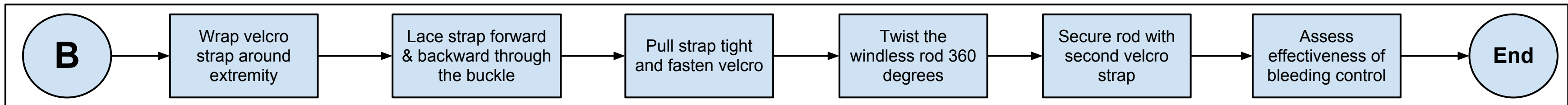
Circulation - Acute hemorrhage & bleeding control simulation algorithm



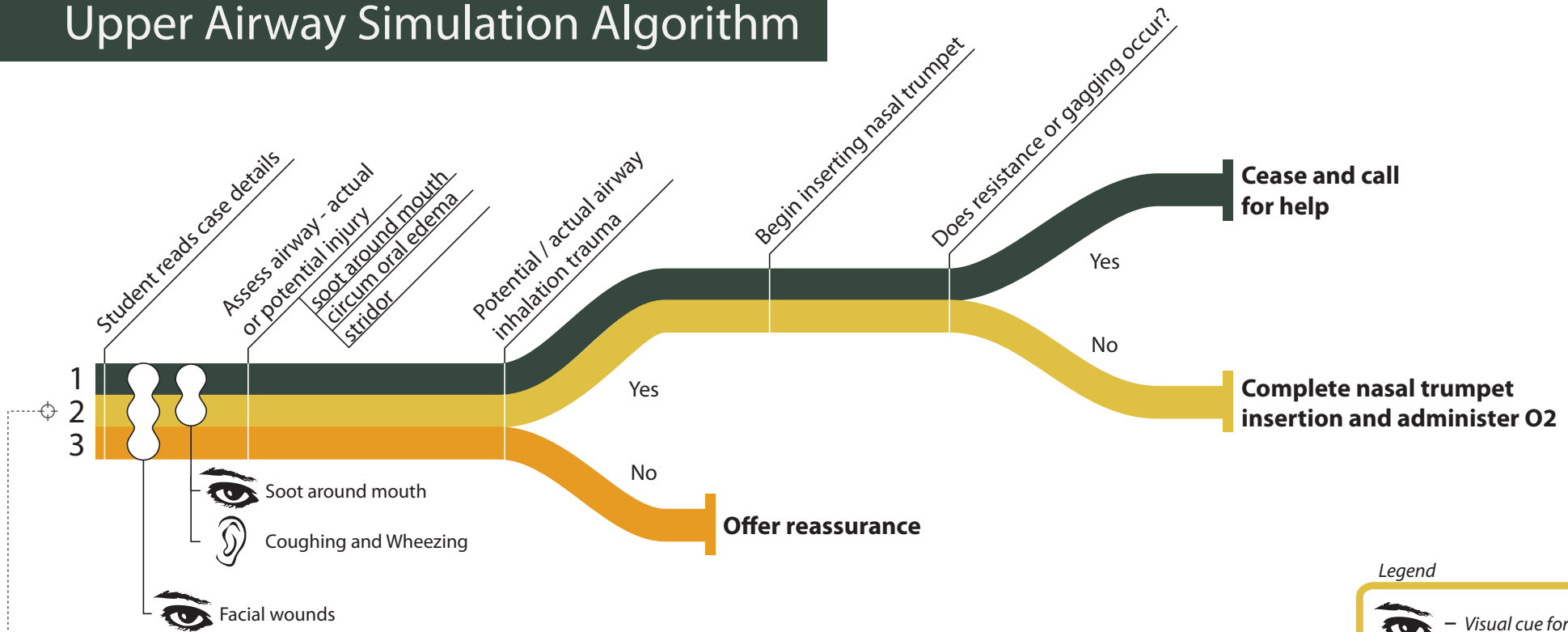
Assess situation



Apply Tourniquet





Upper Airway Simulation Algorithm



Scenarios

- 1) High-Risk: Potential or actual trauma / Resistance occurs
- 2) High-Risk: Potential or actual trauma / Resistance does not occur
- 3) Low-Risk: No potential or actual trauma

Legend

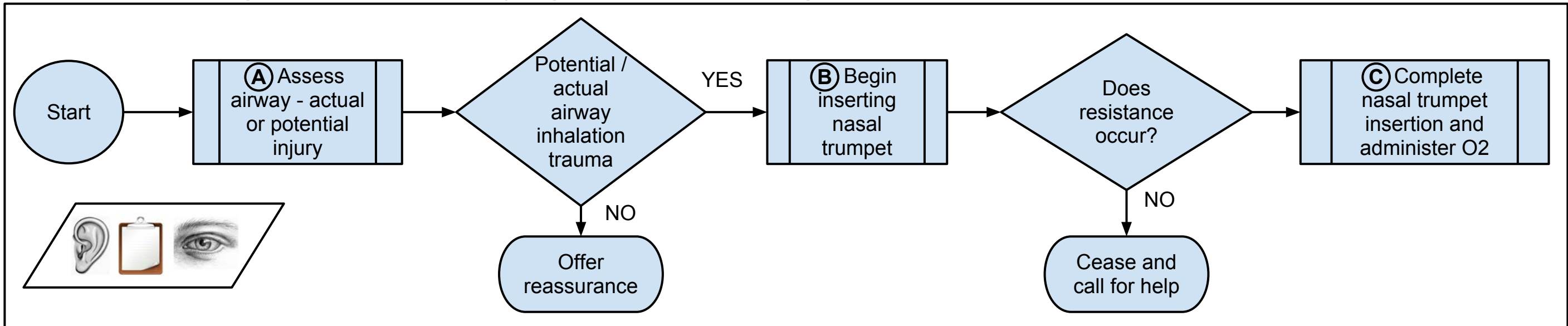
-  – Visual cue for student
-  – Auditory cue for student



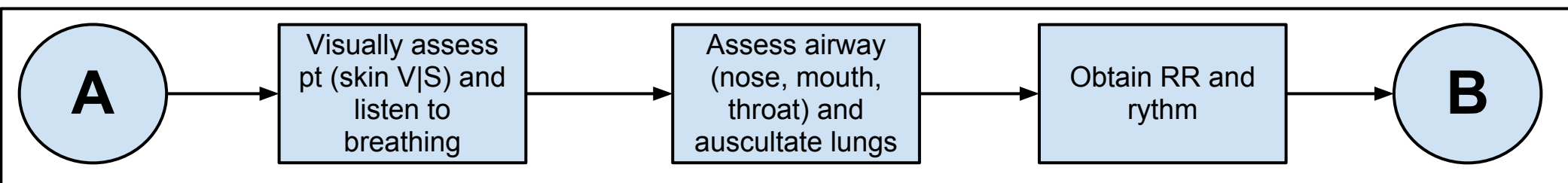
School of Nursing and Dental Hygiene
University of Hawai'i at Mānoa

Scenario C - Upper Airway: Simulation algorithm

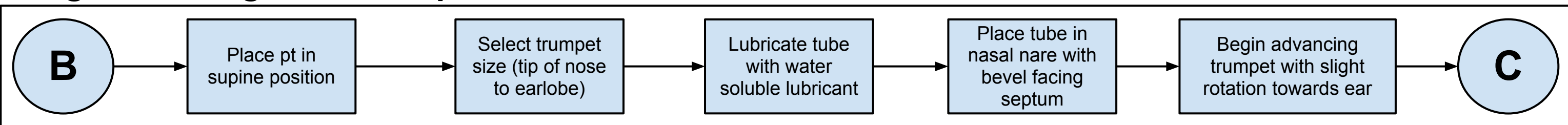
Upper Airway - Inhalation injury simulation algorithm



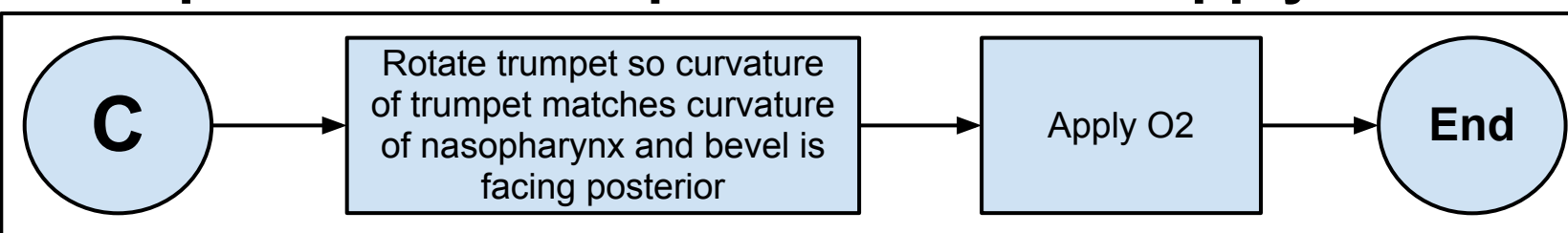
Assess airway - actual or potential injury



Begin inserting nasal trumpet



Complete nasal trumpet insertion and apply O2



Simulation Lesson Plan Outline - C-collar Application (60 min)

Scenario

Marine SGT Mapu is a 24 year old Samoan male who fell 20ft from an obstacle course climbing tower during training this morning. He landed on the grass surface below. He was alert and oriented at the scene, and did not lose consciousness. His training buddies put him in the back of a pick-up truck and drove him to the emergency department. Immediate triage vital signs done by the intake medic are 132/82, HR 94, RR 28, O2 Sat 94% on room air. Intake medic put him on a gurney because he was complaining of being light-headed from not eating breakfast.

Background

Marine SGT Mapu is assigned to the Marine Corps Base in Kaneohe. He is married and has 1 son (4yo).

PMH: healthy male, history of fracture on the right humerus playing rugby in high-school. No known allergies.

Last medical clinic VS: 120/78, HR 64, RR 18, T 98, O2 Sat 95%

Medications: no prescription medications and no history of recreational drug or alcohol use.

Student Learning Objectives

- Recognize potential need for C-spine immobilization
- Make an appropriate decision to initiate C-collar application
- Make an appropriate decision to continue C-collar application or cease C-collar application
- Use correct technique for C-collar application: C-collar size, placement on body, tightness

***note** – Information in *italics* denotes rationale for teaching methods

Topics	Content Summary	HF-SIM	PCSB	Time
Assessment / Pre-test	Knowledge, Skills, & Attitudes / Sense of self efficacy	1) Identification of indications or contra indications to apply a C-collar 2) Selection of an appropriate C-collar size 3) Correct application of C-collar 4) Initiates continuation of care upon completion of C-collar application	1) Identification of indications or contra indications to apply a C-collar 2) Selection of an appropriate C-collar size 3) Correct application of C-collar 4) Initiates continuation of care upon completion of C-collar application	15 min

Topics	Content Summary	HF-SIM	PCSB	Time	Faculty
Introduction to C-spine injuries, their importance, and their relevance to nurses.	<p>C-spine anatomy and consequences of C-spine fracture or dislocation.</p> <p>C-spine injury can result in a fracture or dislocation to the spinal cord that results in paralysis or death.</p> <p><i>*Stimulating recall of prior learning/events facilitates the learning process. It is easier for learners to store information they can link to personal experiences and knowledge.</i></p>	PowerPoint lecture followed by class discussion on any prior experiences with C-collar application and spinal trauma.	PowerPoint presentation with instructor audio followed by the learner typing in any prior experiences with C-collar application and spinal trauma into a textbox.	5 min	Dr. Kristine Qureshi
Overview of decisions to apply, interrupt, or not apply C-collar.	<p>Summarize process of C-collar application.</p> <p>1) Recognize potential for C-spine injury (If there is potential then immobilize the spine)</p> <p>2) Select size and prepare C-collar for application</p>	<p>PowerPoint lecture briefly explaining major steps of C-collar application.</p> <p>In-class demonstration of C-collar application.</p>	<p>PowerPoint presentation with instructor audio briefly explaining major steps of C-collar application.</p> <p>Video demonstration with instructor audio of C-collar application.</p>	5 min	Dr. Kristine Qureshi

	<p>3) Perform in-line spinal stabilization</p> <p>4) Apply C-collar</p> <p>5) Initiate continuation of care</p> <p>Summarize reasons to refrain from or cease C-collar application.</p> <p>Demonstrate process of C-collar application.</p> <p><i>*The most effective way of teaching a whole problem is to demonstrate an instance of the problem first then cover the skills involved. For example, if are teaching about what a car is we start with the car as a whole, and then discuss what the pieces do (ex: brakes).</i></p>				
Spinal trauma indicators for C-collar application.	<p>Mechanism of injury:</p> <ul style="list-style-type: none"> • Fall > 15ft • Whiplash injury 	PowerPoint lecture explaining spinal trauma indicators for C-collar application.	PowerPoint presentation with instructor audio explaining spinal trauma indicators for C-collar application.	3 min	Dr. Kristine Qureshi

	<p>Symptoms</p> <ul style="list-style-type: none"> • Numbness or tingling in extremities • Report of hearing or feeling a snap in neck 				
C-collar sizes, styles, size measurement, and selection.	<p>Review C-collar sizes and styles.</p> <p>Explain how to measure patient for correct size of C-collar, and select appropriate C-collar.</p> <p>Explain how to setup C-collar before application.</p>	<p>Instructor demonstration of C-collar sizes and styles.</p> <p>Instructor demonstration on measuring correct C-collar size, selecting appropriate C-collar, and setting up C-collar prior to application.</p> <p>Short student practice of measuring appropriate C-collar size, selecting appropriate C-collar, and setting up C-collar prior to application.</p>	<p>Video demonstration with instructor audio of C-collar sizes and styles.</p> <p>Video demonstration with instructor audio of measuring correct C-collar size, selecting appropriate C-collar, and setting up C-collar prior to application.</p> <p>Student practices on an interactive video that pauses and allows the learner to select appropriate actions. Student receives feedback after each selection then continues through the video until the next action must be performed.</p>	5 min	Dr. Kristine Qureshi
Performing in-line spinal stabilization of neck for C-collar application.	<p>Explain the process of placing head and neck in alignment for C-collar application.</p>	<p>Instructor demonstration of performing in-line stabilization of neck for C-collar application.</p> <p>Short student practice on</p>	<p>Video demonstration with instructor audio on performing in-line stabilization of neck for C-collar application</p>	4 min	Dr. Kristine Qureshi

		performing in-line stabilization of neck for C-collar application.	Student practices on an interactive video that pauses and allows the learner to select appropriate actions. Student receives feedback after each selection then continues through the video until the next action must be performed.		
How to apply a C-collar.	<p>Process of C-collar application.</p> <p>Important concerns during C-collar application:</p> <ol style="list-style-type: none"> 1) No jarring of patient 2) Correct chin/neck placement 3) Proper fit & size verification <p>After applying C-collar immobilize head with tape to backboard or bed.</p> <p>Place patient on side if they begin to vomit. Keep C-collar in place and body aligned.</p>	<p>Instructor demonstration on applying a C-collar with examples (ex: not jarring patient) and non-examples (ex: jarring patient) of important concerns.</p> <p>Short student practice on applying a C-collar.</p>	<p>Video demonstration with instructor audio of C-collar application with examples (ex: not jarring patient) and non-examples (ex: jarring patient) of important concerns.</p> <p>Student practices on an interactive video that pauses and allows the learner to select appropriate actions. Student receives feedback after each selection then continues through the video until the next action must be performed.</p>	5 min	Dr. Kristine Qureshi
Situations to cease C-collar	When tingling in extremities increases	PowerPoint lecture of situations to cease C-collar application.	Video presentation with instructor audio of situations	3 min	Dr. Kristine Qureshi

application.	<p>during C-collar application.</p> <p>When airway obstruction occurs during C-collar application.</p>		to cease C-collar application.		
Review of decisions to apply, interrupt, or not apply C-collar.	<p>Summarize process of C-collar application.</p> <p>1) Recognize potential for C-spine injury (If there is potential then immobilize the spine)</p> <p>2) Select size and prepare C-collar for application</p> <p>3) Perform in-line spinal stabilization</p> <p>4) Apply C-collar</p> <p>5) Initiate continuation of care</p> <p>Summarize reasons to refrain from or cease C-collar application.</p> <p>Demonstrate process of C-collar application.</p>	<p>PowerPoint lecture briefly summarizing C-collar application.</p> <p>Student practices full C-collar application process.</p>	<p>Video presentation with instructor audio briefly summarizing C-collar application.</p> <p>Student practices on an interactive video that pauses and allows the learner to select appropriate actions. Student receives feedback after each selection then continues through the video until the next action must be performed. (Can be repeated multiple times)</p>	5 min	Dr. Kristine Qureshi

Topics	Content Summary	HF-SIM	PCSB	Time
Assessment / Post-test	Knowledge, Skills, & Attitudes / Sense of self efficacy	1) Identification of indications or contra indications to apply a C-collar 2) Selection of an appropriate C-collar size 3) Correct application of C-collar 4) Initiates continuation of care upon completion of C-collar application	1) Identification of indications or contra indications to apply a C-collar 2) Selection of an appropriate C-collar size 3) Correct application of C-collar 4) Initiates continuation of care upon completion of C-collar application	10 min

Simulation Lesson Plan Outline – Acute Hemorrhage Control (60 min)

Scenario

Right leg acute vascular hemorrhage

Background

Student Learning Objectives

- Recognize actual or potential trauma
- Classify severity of hemorrhage
- Correctly apply a combat application tourniquet
- Correctly assess bleeding control

***note** – Information in *italics* denotes rationale for teaching methods

Topics	Content Summary	HF-SIM	PCSB	Time
Assessment / Pre-test	Knowledge, Skills, & Attitudes / Sense of self efficacy	1) Identification of indications or contra indications for acute hemorrhage control 2) Correctly classify severity of hemorrhage 3) Correct application of combat application tourniquet 4) Correctly assess bleeding control	1) Identification of indications or contra indications for acute hemorrhage control 2) Correctly classify severity of hemorrhage 3) Correct application of combat application tourniquet 4) Correctly assess bleeding control	15 min

Topics	Content Summary	HF-SIM	PCSB	Time	Faculty
Introduction to acute hemorrhage control, its importance, and its relevance to nurses.	<p>What is acute hemorrhage?</p> <p>What are the results of acute hemorrhage?</p> <p>The #1 priority is to stop the flow of blood!</p> <p><i>*Stimulating recall of prior learning/events facilitates the learning process. It is easier for learners to store information they can link to personal experiences and knowledge.</i></p>	<p>PowerPoint lecture followed by class discussion on any prior experiences with acute hemorrhage control.</p>	<p>PowerPoint presentation with instructor audio followed by the learner typing in any prior experiences with acute hemorrhage control into a textbox.</p>	5 min	Dr. Kristine Qureshi
Overview of decisions to identify, apply, or not apply acute hemorrhage control.	<p>Summarize process of acute hemorrhage control.</p> <p>1) Assessing for actual or potential acute trauma</p> <p>2) Applying a combat application tourniquet</p>	<p>PowerPoint lecture briefly explaining major steps of acute hemorrhage control.</p> <p>In-class demonstration of acute hemorrhage control.</p>	<p>PowerPoint presentation with instructor audio briefly explaining major steps of acute hemorrhage control.</p> <p>Video demonstration with instructor audio of acute hemorrhage control.</p>	5 min	Dr. Kristine Qureshi

	<p>3) Assessing bleeding control after applying a combat application tourniquet</p> <p><i>*The most effective way of teaching a whole problem is to demonstrate an instance of the problem first then cover the skills involved. For example, if are teaching about what a car is we start with the car as a whole, and then discuss what the pieces do (ex: brakes).</i></p>				
Assessing for actual or potential acute trauma	<p>Explain how to classify hemorrhage as massive, moderate, or minimal bleeding.</p> <p>Discussion of vital signs and skin indicators present during acute hemorrhage.</p>	<p>PowerPoint lecture on how to assess for actual or potential acute trauma.</p> <p>In-class demonstration of actual or potential acute trauma assessment.</p> <p>Short student practice on assessing for actual or potential acute trauma.</p>	<p>PowerPoint presentation with instructor audio explaining assessment for actual or potential acute trauma.</p> <p>Video demonstration with instructor audio of assessment for actual or potential acute trauma.</p> <p>Student practices on an interactive video that pauses</p>	5 min	Dr. Kristine Qureshi

			and allows the learner to select appropriate actions. Student receives feedback after each selection then continues through the video until the next action must be performed.		
How to apply a combat application tourniquet.	<p>Explain steps for applying a combat application tourniquet</p> <ol style="list-style-type: none"> 1) Place combat application tourniquet around the wounded leg 2) Pull Velcro strap through the buckle 3) Tighten Velcro strap until tourniquet is snug around the leg 4) Twist tourniquet rod to tighten 5) Secure rod with Velcro strap 	<p>Instructor demonstration of applying a combat application tourniquet.</p> <p>Short student practice of applying a combat application tourniquet.</p>	<p>Video demonstration with instructor audio on applying a combat application tourniquet.</p> <p>Student practices on an interactive video that pauses and allows the learner to select appropriate actions. Student receives feedback after each selection then continues through the video until the next action must be performed.</p>	10 min	Dr. Kristine Qureshi
How to assess bleeding control.	Examine for cessation of blood flow.	<p>Instructor demonstration on how to assess bleeding control.</p> <p>Short student practice on assessing bleeding control.</p>	<p>Video demonstration with instructor audio on assessing bleeding control.</p> <p>Student practices on an interactive video that pauses and allows the learner to</p>	5 min	Dr. Kristine Qureshi

			select appropriate actions. Student receives feedback after each selection then continues through the video until the next action must be performed.		
Review of decisions to identify, apply, or not apply acute hemorrhage control.	<p>Summarize process of acute hemorrhage control.</p> <p>1) Assessing for actual or potential acute trauma</p> <p>2) Applying a combat application tourniquet</p> <p>3) Assessing bleeding control after applying a combat application tourniquet</p>	<p>PowerPoint lecture briefly summarizing acute hemorrhage control.</p> <p>Student practices full process of acute hemorrhage control.</p>	<p>Video presentation with instructor audio briefly summarizing acute hemorrhage control.</p> <p>Student practices on an interactive video that pauses and allows the learner to select appropriate actions. Student receives feedback after each selection then continues through the video until the next action must be performed. (Can be repeated multiple times)</p>	5 min	Dr. Kristine Qureshi

Topics	Content Summary	HF-SIM	PCSB	Time
Assessment / Pre-test	Knowledge, Skills, & Attitudes / Sense of self efficacy	<p>1) Identification of indications or contra indications for acute hemorrhage control</p> <p>2) Correctly classify severity of hemorrhage</p> <p>3) Correct application of CAT</p> <p>4) Correctly assess bleeding control</p>	<p>1) Identification of indications or contra indications for acute hemorrhage control</p> <p>2) Correctly classify severity of hemorrhage</p> <p>3) Correct application of CAT</p> <p>4) Correctly assess bleeding control</p>	10 min

Simulation Lesson Plan Outline – Upper Airway Respiratory Injury

(60 min)

Scenario

Background

Student Learning Objectives

- Recognize potential for upper airway respiratory injury
- Select correct size of nasal trumpet
- Correctly insert nasal trumpet into upper airway
- Correctly orient nasal trumpet after insertion and apply O2

***note** – Information in *italics* denotes rationale for teaching methods

Topics	Content Summary	HF-SIM	PCSB	Time
Assessment / Pre-test	Knowledge, Skills, & Attitudes / Sense of self efficacy	1) Identification of indications or contra indications for upper airway respiratory injury 2) Select appropriately sized nasal trumpet for patient 3) Correctly insert nasal trumpet into upper airway 4) Place nasal trumpet in correct final orientation and apply O2	1) Identification of indications or contra indications for upper airway respiratory injury 2) Select appropriately sized nasal trumpet for patient 3) Correctly insert nasal trumpet into upper airway 4) Place nasal trumpet in correct final orientation and apply O2	15 min

Topics	Content Summary	HF-SIM	PCSB	Time	Faculty
Introduction to upper airway inhalation injuries, its importance, and its relevance to nurses.	<p>Upper airway inhalation consequences:</p> <ol style="list-style-type: none"> 1) Direct damage to respiratory tract tissue 2) Inflammation of upper airway structures <p>Can result in obstruction of upper airway.</p> <p><i>*Stimulating recall of prior learning/events facilitates the learning process. It is easier for learners to store information they can link to personal experiences and knowledge.</i></p>	<p>PowerPoint lecture followed by class discussion on any prior experiences with upper airway inhalation injuries and nasal trumpet insertion.</p>	<p>PowerPoint presentation with instructor audio followed by the learner typing in any prior experiences with upper airway inhalation injuries and nasal trumpet insertion into a textbox.</p>	5 min	Dr. Kristine Qureshi
Overview of decisions to identify upper airway inhalation injuries and to apply, or not apply a nasal trumpet.	<p>Summarize process of intervention for upper airway inhalation injuries.</p> <ol style="list-style-type: none"> 1) Assess airway for actual or potential injury 	<p>PowerPoint lecture briefly explaining major steps in identifying and intervening in upper airway inhalation injuries.</p> <p>In-class demonstration of identifying and intervening in upper airway inhalation injuries.</p>	<p>PowerPoint presentation with instructor audio briefly explaining major steps in identifying and intervening in upper airway inhalation injuries.</p> <p>Video demonstration with</p>	5 min	Dr. Kristine Qureshi

	<p>2) Measure, select, and begin inserting a nasal trumpet</p> <p>3) What to do if resistance occurs</p> <p>4) Completing nasal trumpet insertion and administration of O2</p> <p><i>*The most effective way of teaching a whole problem is to demonstrate an instance of the problem first then cover the skills involved. For example, if are teaching about what a car is we start with the car as a whole, and then discuss what the pieces do (ex: brakes).</i></p>		instructor audio of identifying and intervening in upper airway inhalation injuries.		
How to assess an upper airway for actual or potential injury.	<p>Signs of upper airway / inhalation injury:</p> <ul style="list-style-type: none"> History of smoke, chemical or extreme heat exposure 	<p>PowerPoint lecture on assessing an airway for actual or potential injury.</p> <p>In-class demonstration of assessing an upper airway for actual or potential injury.</p>	<p>PowerPoint presentation with instructor audio on assessing an airway for actual or potential injury.</p> <p>Video demonstration with instructor audio on assessing an upper airway for actual or</p>	5 min	Dr. Kristine Qureshi

	<ul style="list-style-type: none"> • Soot around or in mouth, nose, and/or nasal pharynx • Visible edema or swelling of upper airway tissues • Symptoms of strider 	Short student practice on assessing an upper airway for actual or potential injury.	<p>potential injury.</p> <p>Student practices on an interactive video that pauses and allows the learner to select appropriate actions. Student receives feedback after each selection then continues through the video until the next action must be performed.</p>		
Selecting and beginning insertion of a nasal trumpet.	<p>Demonstrate nasal trumpet sizes. Show how to measure patient for appropriate nasal trumpet size.</p> <p>Explain how to insert nasal trumpet.</p> <ol style="list-style-type: none"> 1) Lubricate tube with water or water soluble lubricant 2) Place tube in nasal nare with bevel facing septum 3) Begin advancing trumpet with slight rotation towards ear 	<p>In-class demonstration of measuring, selecting, and beginning the insertion of a nasal trumpet.</p> <p>Short student practice on measuring, selecting, and beginning the insertion of a nasal trumpet</p>	<p>Video demonstration with instructor audio of measuring, selecting, and beginning the insertion of a nasal trumpet.</p> <p>Student practices on an interactive video that pauses and allows the learner to select appropriate actions. Student receives feedback after each selection then continues through the video until the next action must be performed.</p>	5 min	Dr. Kristine Qureshi
How to identify resistance during nasal trumpet insertion, and appropriate	Explanation of what causes resistance, and why insertion should be halted.	PowerPoint lecture on identifying resistance to nasal trumpet insertion and appropriate responses.	PowerPoint presentation with instructor audio on identifying resistance to nasal trumpet insertion and appropriate responses.	5 min	Dr. Kristine Qureshi

responses.	What to do when resistance occurs.				
How to complete nasal trumpet insertion.	<p>Final rotation of nasal trumpet after complete insertion: Rotate trumpet so curvature of trumpet matches curvature of nasal pharynx and bevel is facing posterior.</p> <p>Why and how to administer O2 after nasal trumpet is inserted.</p>	<p>In-class demonstration of completing nasal trumpet insertion and O2 administration.</p> <p>Short student practice on completing nasal trumpet insertion and O2 administration.</p>	<p>Video demonstration with instructor audio of completing nasal trumpet insertion and O2 administration.</p> <p>Student practices on an interactive video that pauses and allows the learner to select appropriate actions. Student receives feedback after each selection then continues through the video until the next action must be performed.</p>	5 min	Dr. Kristine Qureshi
Review of decisions to identify upper airway inhalation injuries and to apply, or not apply a nasal trumpet.	<p>Summarize process of intervention for upper airway inhalation injuries.</p> <p>1) Assess airway for actual or potential injury</p> <p>2) Measure, select, and begin inserting a nasal trumpet</p> <p>3) What to do if resistance occurs</p> <p>4) Completing nasal trumpet insertion and administration of O2</p>	<p>PowerPoint lecture briefly summarizing intervention for upper airway inhalation injuries.</p> <p>Student practices full process of intervention for upper airway inhalation injuries.</p>	<p>Video presentation with instructor audio briefly summarizing intervention for upper airway inhalation injuries.</p> <p>Student practices on an interactive video that pauses and allows the learner to select appropriate actions. Student receives feedback after each selection then continues through the video until the next action must be performed. (Can be repeated multiple times)</p>	5 min	Dr. Kristine Qureshi

Topics	Content Summary	HF-SIM	PCSB	Time
Assessment / Pre-test	Knowledge, Skills, & Attitudes / Sense of self efficacy	1) Identification of indications or contra indications for upper airway respiratory injury 2) Select appropriately sized nasal trumpet for patient 3) Correctly insert nasal trumpet into upper airway 4) Place nasal trumpet in correct final orientation and apply O2	1) Identification of indications or contra indications for upper airway respiratory injury 2) Select appropriately sized nasal trumpet for patient 3) Correctly insert nasal trumpet into upper airway 4) Place nasal trumpet in correct final orientation and apply O2	10 min

Simulation Learning: PC-Screen Based (PCSB) versus High Fidelity Simulation (HFS).
Version #1 Date: 1 February 2012

Appendix 4 – Pre- Training Assessment
Tripler Army Medical Center and the University of Hawaii at Manoa

Simulation Study: Development of a Model to Compare of PC Screen Based and High Fidelity Simulation Instruction of Trauma Nursing Skills

Pre Training Assessment Tool

Participant secret code: _____

Introduction: This is a study to develop a model that can be used to compare PC screen based with high fidelity simulation learning. All procedures should have been reviewed with you during the information and consent process. If you have any questions, please feel free to ask them. There are three parts to your involvement. First: pre training assessment, second: training (via either PC Screen training or high fidelity simulation training) and lastly post training assessment. This is the pre training assessment portion. At this point in time you are being asked to complete the pre training assessment which includes:

1. We will give you a secret code for yourself, which will include both letters and numbers. You will be asked to enter this code on each of the forms that are used in all portions of the pre and post assessment evaluation activities. This will allow us to match the pre and post assessment data without identifying who you are. Now enter this code on the top of this form in the *participant secret code section*.
2. Read the pre- assessment questions and enter your answer for each item. When you are completed, please place this form in the envelope provided and seal it, and give it to the research assistant.

Demographic information

1. Gender: Male ___ Female ___
2. Age in years: ___
3. What type of nurse are you? Civilian RN ___ Military RN ___
4. Highest degree in nursing: Baccalaureate ___ Master's ___ Doctorate ___
5. Years experience as a Registered Nurse: _____
6. Have you ever worked in a trauma unit or emergency department as an RN?
No ___ Yes ___, if yes, how many years? _____

Sense of your confidence for trauma nursing skills

Please read each statement and indicate your degree of confidence for each element of the skills noted below.

not at all confident=1; slightly confident=2; confident=3; highly confident=4

Cervical spine immobilization skill

- | | | | | |
|---|---|---|---|---|
| 1. I can recognize the need to immobilize a cervical spine | 1 | 2 | 3 | 4 |
| 2. I can recognize contraindications of applying a cervical collar | 1 | 2 | 3 | 4 |
| 3. I can select the correct size cervical collar | 1 | 2 | 3 | 4 |
| 4. I can correctly apply a cervical collar on an adult | 1 | 2 | 3 | 4 |
| 5. I can recognize indications for ceasing application of a cervical collar | 1 | 2 | 3 | 4 |

Acute hemorrhage control skill (tourniquet application)

- | | | | | |
|---|---|---|---|---|
| 1. I can recognize an acute hemorrhage situation | 1 | 2 | 3 | 4 |
| 2. I can correctly select use of a pressure dressing vs. application of a tourniquet for bleeding control | 1 | 2 | 3 | 4 |
| 3. I can correctly apply a tourniquet in under 15 seconds for bleeding control | 1 | 2 | 3 | 4 |
| 4. I can accurately assess the effectiveness of a tourniquet | 1 | 2 | 3 | 4 |
| 5. I can evaluate the risks vs. benefits for tourniquet use in situations | 1 | 2 | 3 | 4 |

Upper airway protection

- | | | | | |
|--|---|---|---|---|
| 1. I can recognize signs and symptoms of risk to upper airway patency | 1 | 2 | 3 | 4 |
| 2. I can recognize the need to protect the upper airway | 1 | 2 | 3 | 4 |
| 3. I can select the correct size of nasal airway device | 1 | 2 | 3 | 4 |
| 4. I can correctly insert a nasal airway | 1 | 2 | 3 | 4 |
| 5. I can recognize indications for ceasing insertion of a nasal airway | 1 | 2 | 3 | 4 |

Knowledge about the trauma nursing skills

Please read each question and select your choice for an answer.

- A fall from what level is considered risk for cervical spine injury:
___ 10 ft. ___ 15 ft. ___ 20 ft. ___ 25 ft.
- A cervical collar should only be applied if the patient has a significant history and actual symptoms of cervical spine injury. ___ This is false ___ This is true
- Cervical collar application can result in accentuation of neurological symptoms
___ This is false ___ This is true

4. If a patient begins to vomit immediately after application of a cervical collar, the nurse should immediately remove the collar. ☐ This is false ☐ This is true
5. In any setting, application of a tourniquet is the preferred method to control profuse bleeding. ☐ This is false ☐ This is true
6. Once applied, a tourniquet should be released every 2 minutes to assure oxygenation of the tissues proximal to the injury ☐ This is false ☐ This is true
7. A tourniquet that is placed on a leg should be applied just below the groin area in order to achieve pressure on the femoral artery. ☐ This is false ☐ This is true
8. After a tourniquet has been placed the nurse notices that the blood flow has not stopped. The next thing to do is to elevate the extremity. ☐ This is false ☐ This is true
9. When inserting a nasal airway, the airway is initially inserted with the beveled end facing towards the nasal septum regardless of whether the right or left nare is cannulated with the airway. ☐ This is false ☐ This is true
10. A nasal airway is only used for persons who are unconscious ☐ This is false ☐ This is true
11. Use of a nasal pharyngeal airway is not the preferred method of choice to maintain an airway in a person who has sustained severe facial injuries and has a large amount of trauma to the oral pharyngeal area. ☐ This is false ☐ This is true
12. After insertion of a nasal airway, the nurse notices that there is a large amount of secretions in the patient's mouth; the first thing to do is suction the nasal airway. ☐ This is false ☐ This is true

After completion of this section you will be asked to complete three trauma nursing skills on the simulation mannequin. Please place this form in the envelope provided, seal it and give to the research assistant. Do not tell anyone your secret code! All information provided by you is anonymous)

Notes to IRB committee: Re: rationale for demographic data and reference source for skills procedures. (These notes will not be on the assessment form given to the participant)

1. Re: demographic data: Age and gender are included in demographics as research shows that one's sense of self confidence can be influenced by age, gender, and prior experience with a skill. References for such include: (Pajares, F. (2002). Self-efficacy beliefs in academic contexts: an outline. Available at: <http://des.emory.edu/mfp/efftalk.html> , Accessed Feb 14, 2012. ; Busch, T. (1995).

- Gender differences in self-efficacy and attitudes toward computers. Journal of Educational Computing Research, 12, 147-158.; Sethuraman, S., & Medley, M. D. (2009). Age and self-efficacy in programming. Journal of Computing Sciences in Colleges, 25(2), 122-128.*
2. *Prior experience is included as logic dictates that those with prior experience in trauma or emergency department nursing will have a higher level of knowledge and perhaps sense of confidence than those that do not.*
 3. *Madigan, K. (2009). Spinal Immobilization. In Emergency Nursing Procedures, 4th Edition, J. Proehl, Editor. Saunders-Elsevier P. 564-8.*
 4. *Laerdal, (2005). Stifneck Select directions for use. (product insert) Wappingers Falls, NY.*
 5. *Combat Application Tourniquet (CAT) Instructions for Use. Composite Resources. Available at: <http://www.combattourniquet.com/pdf/C-A-T-Instructions-11October2007.pdf> Accessed Feb 12, 2012.*
 6. *Clark, D. (2009) Nasal Airway insertion. In Emergency Nursing Procedures, 4th Edition, J. Proehl, Editor. P. 19-21.*

Appendix 6
Skills Checklist Pre and Post Training
Tripler Army Medical Center / University of Hawaii at Manoa
Pre Training Assessment of Skills

Trauma Nursing Skills Performance Checklist *(Note: This sheet will not be shown to the student before instruction. At the pre training assessment session, the participant will be asked to demonstrate the psychomotor skill for each of these skills before instruction begins. The evaluator will read each scenario to the participant and then ask them to complete each of three skills (one at a time). The evaluator will note the performance of the participant without making any comment, and indicate if each skill element was completed by checking off yes or no. This paragraph will not be on the assessment form -- this is for IRB information only)*

Instruction to the participant: (To be read to the participant by the evaluator)

This session is composed of three different scenarios. One at a time, you will be read a scenario and then asked to complete the specific skill. At the conclusion of the skill performance assessment session, the evaluator will fold this assessment form in half and give it to you. We ask that you put your secret code number on the assessment form and then place the form in the envelope and seal it. Then, give the sealed envelope to the research assistant. At the end of the study, the research team will match all of the pre and post assessment forms by number so that we can measure for changes in scores.

I. Cervical Collar Application

Supplies for this skill: high fidelity mannequin, four (4) sizes of a Laerdal cervical collar (short, medium, long and no-neck).

Scenario / Instructions to the student: *The patient has been brought in to the emergency department by his buddies. They state that the patient just fell from a height of 25 feet from a climbing tower. You decide that he requires a cervical collar. Select the correct collar and apply to the mannequin.*

Inject: Immediately after the collar application the patient (mannequin) states: wow, I now feel tingling in both of my hands and arms.

A. Patient preparation

- i. Stabilize the head manually in the position found, ☐ Yes ☐ No
and instruct patient to not move
- ii. Instruct patient to continue to remain still and let the ☐ Yes ☐ No
health providers do the work
- iii. Instruct patient to alert the health providers if any ☐ Yes ☐ No
maneuvers cause symptoms such as: increase in neck

pain, tingling or numbness in extremities, difficulty breathing

- iv. If wearing jewelry around neck, remove such jewelry. ____ Yes ____ No

B. Collar preparation

- i. Select proper sized collar: Use fingers to measure the distance from the top of the shoulder to the bottom of the chin [Note #4.] Locate the sizing line on the collar and match the collar size to the patient. When opened, assembled and applied, the sides of the collar should rest on the shoulders, while the front should lie between the upper chest and under the mandible, and the back of the collar should rest on the posterior thoracic spine, while maintaining the head in a neutral position, (assuring no hyper extension or hyper flexion of the head or neck). ____ Yes ____ No
- ii. Assemble the collar by pulling the front of the collar into the molded head support position and snapping to lateral lock tabs on either side of the collar. ____ Yes ____ No

a. Procedural steps

- i. Return patients head to the neutral position by placing thumbs under the mandible and the index and middle fingers on the occipital ridges. Use just enough traction to support the weight of the head while placing in neutral position. ____ Yes ____ No
- ii. With the collar open slide the lateral and back portion of the collar under the neck, while holding the front of the collar in place (under the mandible and resting of the front of the upper chest), and then secure the Velcro strap. ____ Yes ____ No
- iii. Assess for accentuation or development of new symptoms such as increased neck pain, numbness tingling in extremities or airway obstruction. ____ Yes ____ No

II. CAT Tourniquet Application (Note #5)

Supplies for this skill: high fidelity mannequin mouldaged with large quantity of blood, and active bleeding from lower extremity with bleeding reservoir; CAT tourniquet ; variety of pressure dressing material.

Scenario / Instructions to the student: The patient has been brought in to the emergency department by his buddies. There is a large pressure dressing in place, but very large quantities of blood are draining from the dressing. The buddies report that when he fell from a 20 foot tower he hit his leg on an iron rebar that was protruding from the ground. You decide that the patient requires a tourniquet. Apply the tourniquet.

Inject: After the tourniquet is applied, you notice that there is still a large amount of bleeding from his leg wound.

a. Patient preparation

- i. Expose the site to determine degree of blood loss ___ Yes___ No
and identify location to place tourniquet
- ii. Inform the patient that the tourniquet will be rapidly ___ Yes___ No
applied to stop flow of blood.

b. Assemble equipment

- i. Open the CAT tourniquet package and open the ___ Yes___ No
loop of the tourniquet band
- ii. Open the Velcro from the windlass rod ___ Yes___ No

c. Procedural steps

- i. Insert the wounded extremity through the ___ Yes___ No
tourniquet loop, locating the tourniquet 2-3 inches
above the bleeding wound
- ii. Pull the tourniquet band tight and adhere the ___ Yes___ No
Velcro to secure tight
- iii. Twist the windlass rod until the bright red bleeding ___ Yes___ No
has stopped
- iv. Lock in place the windlass rod with the ___ Yes___ No
windlass clip
- v. Adhere the band over the windlass rod to secure ___ Yes___ No
it in place
- vi. Secure the tourniquet band with the large ___ Yes___ No
Velcro strap
- vii. Reassess for cessation of bleeding, and adjust ___ Yes___ No
as needed

III. Nasal Airway Insertion (Note #6)

Supplies for this skill: Nasal airways and endotracheal tubes in a variety of sizes. Oxygen mask.

Scenario / Instructions to the student: The patient has been brought in to the emergency department by his buddies. The buddies report that the patient fell from a high tower and during the fall they noticed that his face hit a tree branch. You now see a large amount of edema around the lips and mouth. You decide to insert a nasal airway. Insert the airway on the mannequin.

Inject: After the nasal airway is inserted the patient begins to gag violently.

a. Patient preparation

- i. Place patient in supine position or high fowlers ___ Yes___ No

- ii. Identify the largest nostril, assess nasal passages for trauma, foreign body, septal deviation and polyps ☐ Yes ☐ No
- b. Assemble equipment**
 - i. Water soluble lubricant ☐ Yes ☐ No
 - ii. Suction equipment ☐ Yes ☐ No
 - iii. Select the correct sized nasopharyngeal airway. (For diameter, select the largest diameter airway that will pass easily through the nares; for length, measure from the tip of the nose to the tragus of the ear.) An endotracheal tube may be used if a nasopharyngeal airway is not available. ☐ Yes ☐ No
- c. Procedural steps**
 - i. Lubricate the tube with the water soluble agent ☐ Yes ☐ No
 - ii. Pass the airway along the floor of the nostril with the bevel facing the nasal septum. Then, direct the device posteriorly and rotate slightly toward the ear (that is on the same side of the nostril of insertion), until inserted fully, and the flange rests against nostril. Be advised that all nasal airways have a bevel that is angled for right nare insertion. If the left nare is used, insert with the bevel facing the septum, but once the tip is in place, rotate 180 degrees to align the curvature of the airway with that of the naso-pharynx. ☐ Yes ☐ No
 - iii. If during insertion resistance is met, slightly rotate the airway and proceed with insertion slowly. Never force insertion. ☐ Yes ☐ No
 - iv. Assess for patency, suction as necessary. ☐ Yes ☐ No

**Tripler Army Medical Center / University of Hawaii at Manoa
Post Training Assessment of Skills**

Trauma Nursing Skills Performance Checklist (Note: This sheet will not be shown to the student before instruction. At the post training assessment session, the participant will be asked to demonstrate the psychomotor skill of completing each of these skills after instruction is completed. The evaluator will read each scenario to the participant and then ask them to complete each of three skills (one at a time). The evaluator will note the performance of the participant without making any comment, and indicate if each skill element was completed by checking off yes or no. This paragraph will not be on the assessment form -- this is for IRB information only)

Instruction to the participant: (To be read to the participant by the evaluator)

This session is composed of three different scenarios. One at a time, you will be read a scenario and then asked to complete the specific skill. At the conclusion of the skill performance session, the evaluator will fold this assessment form in half and give it to you. We ask that you put your secret code number on the outside of the assessment form and then place the form in the envelope and seal it. Then, give the sealed envelope to the research assistant. At the end of the study, the research team will match all of the pre and post assessment forms by number so that we can measure for changes in scores.

IV. Cervical Collar Application

Supplies for this skill: high fidelity mannequin, four (4) sizes of a Laerdal cervical collar (short, medium, long and no-neck).

Scenario / Instructions to the student: *The patient has been brought in to the emergency department by his buddies. They state that the patient just fell from a height of 25 feet from a climbing tower. You decide that he requires a cervical collar. Select the correct collar and apply to the mannequin.*

Inject: Immediately after the collar application the patient (mannequin) states: wow, I now feel tingling in both of my hands and arms.

C. Patient preparation

- v. Stabilize the head manually in the position found, ☐ Yes ☐ No
and instruct patient to not move
- vi. Instruct patient to continue to remain still and let the ☐ Yes ☐ No
health providers do the work
- vii. Instruct patient to alert the health providers if any ☐ Yes ☐ No
maneuvers cause symptoms such as: increase in neck
pain, tingling or numbness in extremities, difficulty
breathing
- viii. If wearing jewelry around neck, remove such jewelry. ☐ Yes ☐ No

D. Collar preparation

- iii. Select proper sized collar: Use fingers to measure the ☐ Yes ☐ No
distance from the top of the shoulder to the bottom of
the chin [Note #4.] Locate the sizing line on the collar
and match the collar size to the patient. When opened,
assembled and applied, the sides of the collar should
rest on the shoulders, while the front should lie between
the upper chest and under the mandible, and the back of
the collar should rest on the posterior thoracic spine,
while maintaining the head in a neutral position, (assuring
no hyper extension or hyper flexion of the head or neck).
- iv. Assemble the collar by pulling the front of the collar into ☐ Yes ☐ No
the molded head support position and snapping to lateral

lock tabs on either side of the collar.

a. Procedural steps

- i. Return patients head to the neutral position by ____ Yes____ No
placing thumbs under the mandible and the index
and middle fingers on the occipital ridges. Use just
enough traction to support the weight of the head
while placing in neutral position.
- ii. With the collar open slide the lateral and back ____ Yes____ No
portion of the collar under the neck, while holding
the front of the collar in place (under the mandible
and resting of the front of the upper chest), and then
secure the Velcro strap.
- iii. Assess for accentuation or development of new ____ Yes____ No
symptoms such as increased neck pain, numbness
tingling in extremities or airway obstruction.

V. CAT Tourniquet Application (Note #5)

Supplies for this skill: high fidelity mannequin mouldaged with large
quantity of blood, and active bleeding from lower extremity with bleeding
reservoir; CAT tourniquet ; variety of pressure dressing material.

Scenario / Instructions to the student: *The patient has been brought in to
the emergency department by his buddies. There is a large pressure
dressing in place, but very large quantities of blood are draining from the
dressing. The buddies report that when he fell from a 20 foot tower he hit
his leg on an iron rebar that was protruding from the ground. You decide
that the patient requires a tourniquet. Apply the tourniquet.*

Inject: After the tourniquet is applied, you notice that there is still a large
amount of bleeding from his leg wound.

a. Patient preparation

- i. Expose the site to determine degree of blood loss ____ Yes____ No
and identify location to place tourniquet
- ii. Inform the patient that the tourniquet will be rapidly ____ Yes____ No
applied to stop flow of blood.

b. Assemble equipment

- i. Open the CAT tourniquet package and open the ____ Yes____ No
loop of the tourniquet band
- ii. Open the Velcro from the windlass rod ____ Yes____ No

c. Procedural steps

- i. Insert the wounded extremity through the _____ Yes _____ No
tourniquet loop, locating the tourniquet 2-3 inches
above the bleeding wound
- ii. Pull the tourniquet band tight and adhere the _____ Yes _____ No
Velcro to secure tight
- iii. Twist the windlass rod until the bright red bleeding _____ Yes _____ No
has stopped
- iv. Lock in place the windlass rod with the _____ Yes _____ No
windlass clip
- v. Adhere the band over the windlass rod to secure _____ Yes _____ No
it in place
- vi. Secure the tourniquet band with the large _____ Yes _____ No
Velcro strap
- vii. Reassess for cessation of bleeding, and adjust _____ Yes _____ No
as needed

VI. Nasal Airway Insertion (Note #6)

Supplies for this skill: Nasal airways and endotracheal tubes in a variety of sizes. Oxygen mask.

Scenario / Instructions to the student: *The patient has been brought in to the emergency department by his buddies. The buddies report that the patient fell from a high tower and during the fall they noticed that his face hit a tree branch. You now see a large amount of edema around the lips and mouth. You decide to insert a nasal airway. Insert the airway on the mannequin.*

Inject: After the nasal airway is inserted the patient begins to gag violently.

a. Patient preparation

- i. Place patient in supine position or high fowlers _____ Yes _____ No
- ii. Identify the largest nostril, assess nasal passages _____ Yes _____ No
for trauma, foreign body, septal deviation
and polyps

b. Assemble equipment

- i. Water soluble lubricant _____ Yes _____ No
- ii. Suction equipment _____ Yes _____ No
- iii. Select the correct sized nasopharyngeal airway. _____ Yes _____ No
(For diameter, select the largest diameter airway
that will pass easily through the nares; for length,
measure from the tip of the nose to the tragus of
the ear.) An endotracheal tube may be used if an
nasopharyngeal airway is not available.

c. Procedural steps

- i. Lubricate the tube with the water soluble agent _____ Yes _____ No

- ii. Pass the airway along the floor of the nostril with ____ Yes ____ No
the bevel facing the nasal septum. Then, direct
the device posteriorly and rotate slightly toward the
ear (that is on the same side of the nostril of insertion),
until inserted fully, and the flange rests against nostril.
Be advised that all nasal airways have a bevel that is
angled for right nare insertion. If the left nare is used,
insert with the bevel facing the septum, but once the
tip is in place, rotate 180 degrees to align the curvature
of the airway with that of the naso-pharynx.
- iii. If during insertion resistance is met, slightly rotate ____ Yes ____ No
the airway and proceed with insertion slowly. Never
force insertion.
- iv. Assess for patency, suction as necessary. ____ Yes ____ No

Appendix 5 –Post Training Assessment & Post Program Evaluation

Tripler Army Medical Center and the University of Hawaii at Manoa

Simulation Study: Development of a Model to Compare of PC Screen Based and High Fidelity Simulation Instruction of Trauma Nursing Skills

Post Training Assessment Tool

Participant secret code: _____

Introduction: This is the post training assessment portion of the project. At this point In time you are being asked to complete this post training assessment.

3. First, enter your unique (and anonymous) 5 digit code that you developed for yourself and placed on the pre training assessment forms. This will allow us to match the pre and post assessment data without knowing who you are. Now enter this code on the top of this form in the *participant secret code section*.
4. Read the post training assessment questions and enter your answer for each item. When you have completed this part of the assessment, place this form in the envelope, seal it, and give to the research assistant. You will then be asked to proceed to the skills assessment portion of the project.

Sense of your confidence for trauma nursing skills

Please read each statement and indicate your degree of confidence for each element of the skills noted below.

not at all confident=1; slightly confident=2; confident=3; highly confident=4

Cervical spine immobilization skill

- | | | | | |
|--|---|---|---|---|
| 6. I can recognize the need to immobilize a cervical spine | 1 | 2 | 3 | 4 |
| 7. I can recognize contraindications of applying a cervical collar | 1 | 2 | 3 | 4 |
| 8. I can select the correct size cervical collar | 1 | 2 | 3 | 4 |
| 9. I can correctly apply a cervical collar on an adult | 1 | 2 | 3 | 4 |
| 10. I can recognize indications for ceasing application of a cervical collar | 1 | 2 | 3 | 4 |

Acute hemorrhage control skill (tourniquet application)

- | | | | | |
|---|---|---|---|---|
| 6. I can recognize an acute hemorrhage situation | 1 | 2 | 3 | 4 |
| 7. I can correctly select use of a pressure dressing vs. application of a tourniquet for bleeding control | 1 | 2 | 3 | 4 |
| 8. I can correctly apply a tourniquet in under 15 seconds for bleeding control | 1 | 2 | 3 | 4 |
| 9. I can accurately assess the effectiveness of a tourniquet | 1 | 2 | 3 | 4 |
| 10. I can evaluate the risks vs. benefits for tourniquet use in situations | 1 | 2 | 3 | 4 |

Upper airway protection

- | | | | | |
|---|---|---|---|---|
| 6. I can recognize signs and symptoms of risk to upper airway patency | 1 | 2 | 3 | 4 |
| 7. I can recognize the need to protect the upper airway | 1 | 2 | 3 | 4 |
| 8. I can select the correct size of nasal airway device | 1 | 2 | 3 | 4 |
| 9. I can correctly insert a nasal airway | 1 | 2 | 3 | 4 |
| 10. I can recognize indications for ceasing insertion of a nasal airway | 1 | 2 | 3 | 4 |
-

Knowledge about the trauma nursing skills

Please read each question and select your choice for an answer.

13. A fall from what level is considered risk for cervical spine injury:
☐ 10 ft. ☐ 15 ft. ☐ 20 ft. ☐ 25 ft.
14. A cervical collar should only be applied if the patient has a significant history and actual symptoms of cervical spine injury. ☐ This is false ☐ This is true
15. Cervical collar application can result in accentuation of neurological symptoms
☐ This is false ☐ This is true
16. If a patient begins to vomit immediately after application of a cervical collar, the nurse should immediately remove the collar. ☐ This is false ☐ This is true
17. In any setting, application of a tourniquet is the preferred method to control profuse bleeding. ☐ This is false ☐ This is true
18. Once applied, a tourniquet should be released every 2 minutes to assure oxygenation of the tissues proximal to the injury. ☐ This is false ☐ This is true
19. A tourniquet that is placed on a leg should be applied just below the groin area in order to achieve pressure on the femoral artery. ☐ This is false ☐ This is true
20. After a tourniquet has been placed the nurse notices that the blood flow has not stopped. The next thing to do is to elevate the extremity.
☐ This is false ☐ This is true
21. When inserting a nasal airway, the airway is initially inserted with the beveled end facing towards the nasal septum regardless of whether the right or left nare is cannulated with the airway. ☐ This is false ☐ This is true
22. A nasal airway is only used for persons who are unconscious
☐ This is false ☐ This is true

23. Use of a nasal pharyngeal airway is not the preferred method of choice to maintain an airway in a person who has sustained severe facial injuries and has a large amount of trauma to the oral pharyngeal area. ____ This is false ____ This is true
24. After insertion of a nasal airway, the nurse notices that there is a large amount of secretions in the patient's mouth; the first thing to do is suction the nasal airway. ____ This is false ____ This is true

After completion of this section you will be asked to complete three trauma nursing skills on the simulation mannequin. Please place this form in the envelope provided, seal it and give to the research assistant. Do not tell anyone your secret code! All information provided by you is anonymous)

Notes to IRB committee: *Re: rationale for demographic data and reference source for skills procedures. (These notes will not be on the assessment form given to the participant)*

7. *Prior experience is included as logic dictates that those with prior experience in trauma or emergency department nursing will have a higher level of knowledge and perhaps sense of confidence than those that do not.*
8. *Madigan, K. (2009). Spinal Immobilization. In Emergency Nursing Procedures, 4th Edition, J. Proehl, Editor. Saunders-Elsevier P. 564-8.*
9. *Laerdal, (2005). Stifneck Select directions for use. (product insert) Wappingers Falls, NY.*
10. *Combat Application Tourniquet (CAT) Instructions for Use. Composite Resources. Available at: <http://www.combattourniquet.com/pdf/C-A-T-Instructions-11October2007.pdf> Accessed Feb 12, 2012.*
11. *Clark, D. (2009) Nasal Airway insertion. In Emergency Nursing Procedures, 4th Edition, J. Proehl, Editor. P. 19-21.*

Tripler Army Medical Center and the University of Hawaii at Manoa

Simulation Study: Development of a Model to Compare of PC Screen Based and High Fidelity Simulation Instruction of Trauma Nursing Skills

Post Training Program Evaluation

Participant secret code: _____

Check one: Training Group PC Screen based _____ High Fidelity Simulation _____

Introduction: This is a post simulation training program evaluation. At this point in time you are being asked to complete this evaluation of overall training program.

5. First, enter your unique (and anonymous) 5 digit code that you developed for yourself and placed on the pre training assessment forms. This will allow us to match the pre and post assessment data without knowing who you are. Now enter this code on the top of this form in the *participant secret code* section.
6. Read the post simulation training program evaluation questions and enter your answer for each item. When you have completed this evaluation, place this form in the envelope, seal it, and give to the research assistant.

Please read each statement and indicate your level of agreement for each of the statements below.

1=strongly disagree 2= disagree 3=neutral 4=agree 5=strongly agree

Instructional method

- | | |
|---|-----------|
| 1. The method of instruction that I was assigned to is a good one for teaching these types of trauma nursing skills | 1 2 3 4 5 |
| 2. I was able to have any questions that I had answered during the teaching session for each skill | 1 2 3 4 5 |
| 3. There was enough time allotted to learn each of the skills adequately | 1 2 3 4 5 |
| 4. I feel that my time was well spent by participating in this training program | 1 2 3 4 5 |

Learning Outcomes

- | | |
|--|-----------|
| 1. Attendance at this course increased my overall knowledge about these skills | 1 2 3 4 5 |
| 2. As a result of attending this training program, my ability to technically perform each of these skills has improved | 1 2 3 4 5 |
| 3. The content covered in this training program is adequate to teach each skill | 1 2 3 4 5 |

Learning environment

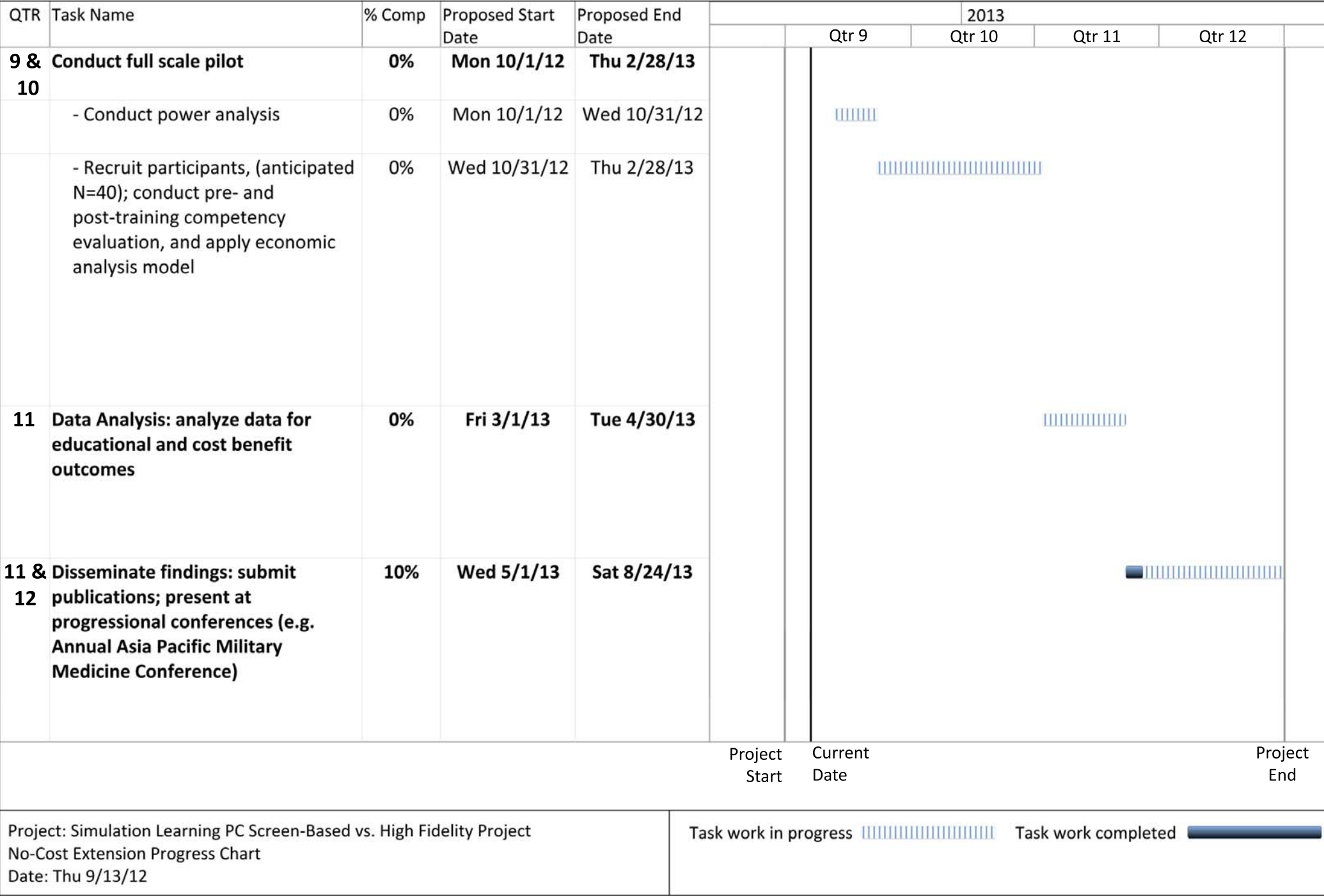
- | | |
|---|-----------|
| 1. The learning environment milieu for this training program was satisfactory to me | 1 2 3 4 5 |
| 2. The pre and post program evaluator was professional | 1 2 3 4 5 |
| 3. Overall, I feel that my rights as a research participant have been respected | 1 2 3 4 5 |

General comments: Please feel free to enter any other comments that you have about the training program itself as well as the method that this study was conducted. Enter comments on the back of this sheet.

Simulation Learning: PC-Screen Based (PCSB) versus High Fidelity Simulation (HFS).
Version #1 Date: 1 February 2012

Note to the IRB committee: This post program evaluation tool has been developed based upon the *Office of Medical Education Research and Development Educational Program Evaluation Framework* from the College of Medicine at Michigan University. It seeks to assess, from the perspective of the participant, post program assessment of the teaching methods, learning outcomes, cost in terms of time for the participant, and the learning / program environment. A summary of this framework is available at: <http://omerad.msu.edu/meded/progeval/step4.html> Special care was made to not duplicate questions that are asked in the knowledge, confidence and clinical skills post assessment section. Additional program cost analysis will be completed by the health economist but will not involve human subjects.

Appendix F: Simulation learning PC screen-based vs high fidelity - No cost extension progress chart



Title: Creating an Evaluation Model for Simulation Learning

COL Denise L. Hopkins-Chadwick, RN, PhD

Dr. Kristine Qureshi, RN, PhD

Dr. Judy Carlson, RN Ed.D

PURPOSE: To develop an evaluation model to determine if there is a difference in competency based learning outcomes and cost effectiveness between learning that is supported by PC screen-based computer simulation vs. high fidelity simulation mannequins for selected trauma nursing functions. **Theoretical**

Framework: The *Nursing Education Simulation Framework* consisting of five key factors : (1) simulation design factors (reality of simulation, complexity of challenges posed), (2) teacher factors (skill, experience), (3) student factors (demographics, educational preparation, and prior professional experience), (4) educational practices (i.e. mode of delivery, time on task, learning setting, and environment), and (5) outcome factors (knowledge, psychomotor skills, self confidence, judgment, and problem solving). **DESIGN:** Non-Experimental, Descriptive study in 3 phases. Phase 1=*Development Phase*-Consists of development of scenarios, algorithms, and economic model. Phase 2=*Test of learning methods and delivery method*-Consists of a pilot test of the learning modules and measures, 2 learners for each module and methodology. Phase 3=*Model Development* Consists of a full scale pilot including pre- and post-training competency evaluation data collection and application of the economic analysis model. **SAMPLE:** 44 nurses for phase 2 and 3 (22 Civilian/22 military).

METHODS: Each of the randomly assigned nurses will receive an orientation to use of both PCSB and HFS method to assure equivalent baseline psychomotor skills for each method. Comparable training lesson plans will be used for each treatment arm, and the competency of each trainee will be evaluated pre-and post-training by an evaluator who is blinded with regards to the trainees' prior experience as a professional nurse, as well as the assigned method (HFS vs. PCSB learning).

Learning Outcome	PCSB evaluation tools	HFS mannequin tools
Knowledge	Written pre- and post-test	Written pre- and post-test
Psychomotor skills	Critical Element Checklist	Critical Element Checklist
Self confidence	Student interview script	Student interview script
Judgment	Observation	Observation
Problem solving	Observation	Observation

DATA ANALYSIS: Data collection is underway. **IMPLICATIONS:** Developing a framework for evaluating simulation methods will provide a uniform way to comparing learning outcomes and cost effectiveness between different methods, **FROM/TO TIME PERIOD OF STUDY:** July 2010 to July 2012. **FUNDING:** TATRC (USAMMRAA)

Development of an Evaluation Model to Compare PC Screen vs. High Fidelity Simulation Teaching for Trauma Nursing in Terms of Learning and Cost

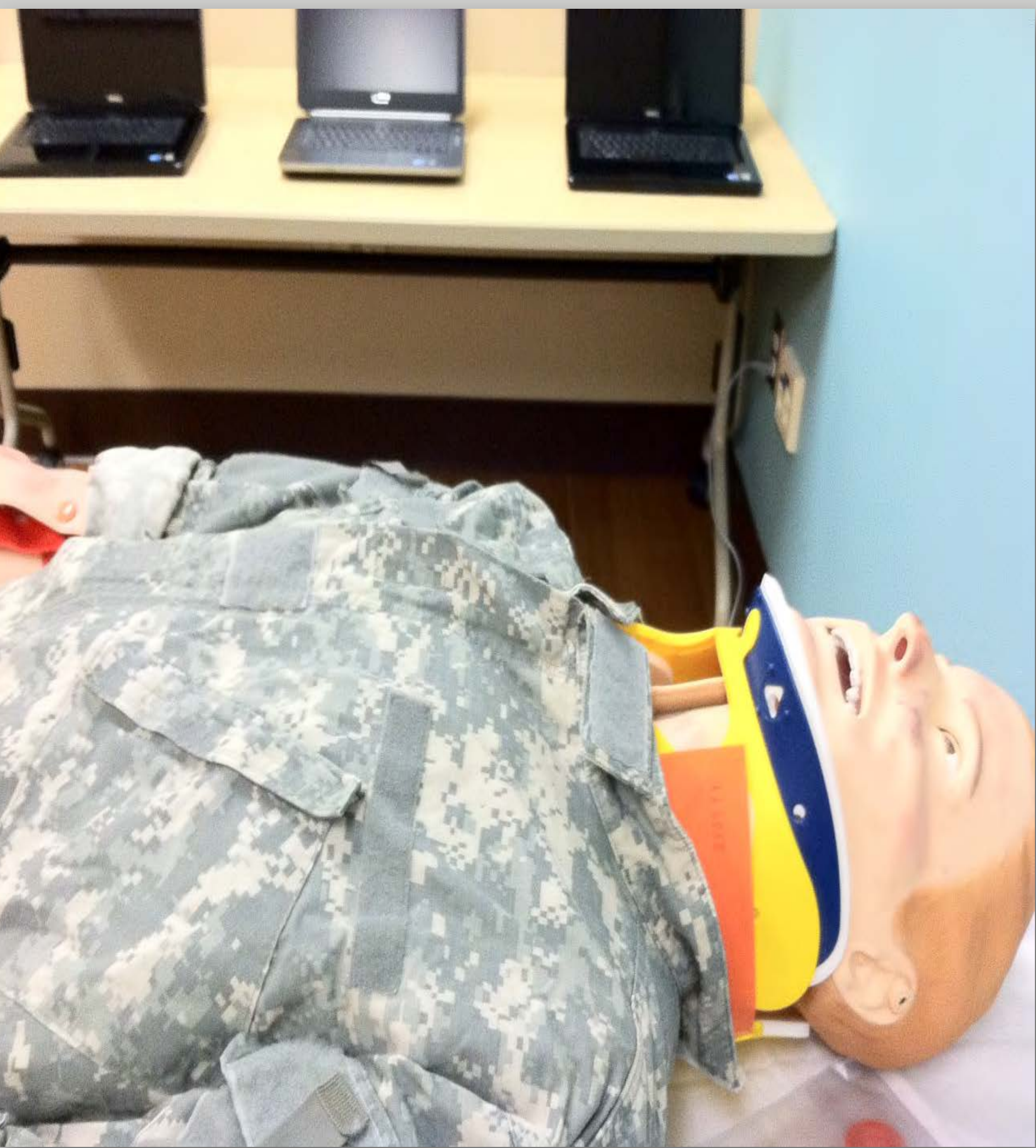


Kristine Qureshi, RN, DNSc, CEN, APHN-BC (PI); COL Denise Hopkins-Chadwick, PhD (PI); Lori Wong, RN, PhD; Deborah Juarez, PhD; Dale Vincent, MPH, MD; Judith Carlson, RN, EdD; Jonathan Kevan (GA); Tracie Nagao-Bregman, (Admin)

Funded by TATRC

Background

- The number and complexity of natural disasters and military engagement continues to rise with increased numbers of wounded civilians and warriors.
- Core trauma care nursing competencies necessary for natural and manmade disaster response have been established, but little is known about the most effective and efficient methods for teaching trauma nursing skills using simulation.
- The Pacific Region geo-political environment is conducive to military and academic interdependency (partnerships).



Research Question

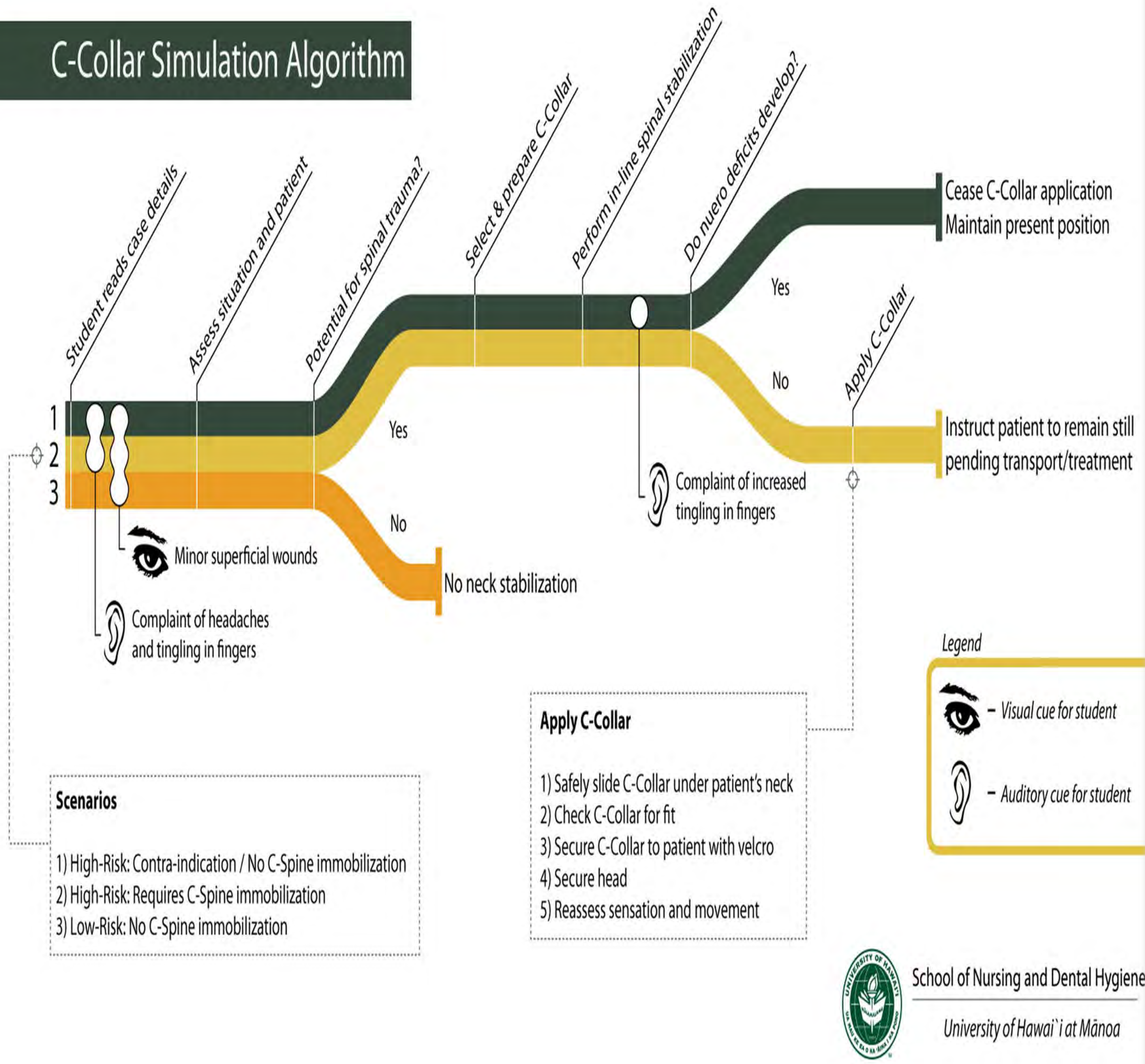
Is there a difference in competency based learning outcomes and cost effectiveness between learning that is supported by PC screen based simulation vs. high fidelity simulation for selected nursing trauma skills?

Steps

1. Chose Disaster and Military Response Nursing Skills to train
2. Design PC Screen and High Fidelity Simulation Teaching modalities:
3. Pilot both modalities (n=4)
4. Teach both modalities (n=22)
5. Apply evaluative model

Development of an Evaluation Model to Compare PC Screen Based vs. High Fidelity Simulation Teaching for Trauma in Terms of Learning and Cost

Kristine Qureshi, RN, DNSc, CEN, APHN-BC (PI); COL Denise Hopkins-Chadwick, PhD (PI); Lori Wong, RN, PhD; Deborah Juarez, PhD; Dale Vincent, MPH, MD; Judy Carlson, RN, EdD; Jonathan Kevan (GA); Tracie Nagao-Bregman, (Admin)



Nursing Skills Being Examined

- Neurological: Cervical spine injury – Assessment, cervical spine stabilization, C-collar selection and application
- Airway: Inhalation injury- Assessment and insertion of nasal trumpet
- Circulation: Acute hemorrhage- assessment and tourniquet application
- Circulation: Acute hemorrhage – IV fluid resuscitation



Importance

Gaining an understanding of the educational outcomes and costs for a variety of simulation methods will enable educators to select the most appropriate method of instruction in light of learning outcomes and costs of instruction.




Progress to Date


- Phase I IRB approval
- Skills selected
- Training modules developed
- Phase II & III IRB approval



Appendix H: Presentation "Model Development to Compare Different Types of Simulation Based Learning for Trauma Nursing Skills Among Military & Civilian Nurses"



Development of an Evaluation Model to Compare PC Screen vs. High Fidelity Simulation Teaching for Trauma Nursing in Terms of Learning and Cost



Kristine Qureshi, RN, DNSc, CEN, APHN-BC (PI)
 Judy Carlson, RN, EdD (TAMC Site PI)
 COL Denise Hopkins-Chadwick, PhD (PI)
 Lorrie Wong, RN, PhD
 Deborah Juarez, PhD
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 Tracie Nagao-Bregman (Admin)

Support for the project; Collaborators; Conflict of interest

- Acknowledgement: This research was supported by the U.S. Department of the Army (Award No. W81XWH-10-2-0061). The U.S. Army Medical Research Acquisition Activity, Fort Detrick, MD is the awarding and administering acquisition office. This content does not necessarily reflect the position or the policy of the Government, and no official endorsement should be inferred
- This project receives administrative support from the Pacific Joint Information Technology Center Biotechnology Hui
- Collaboration between The University of Hawaii at Manoa School of Nursing and the Tripler Army Medical Center

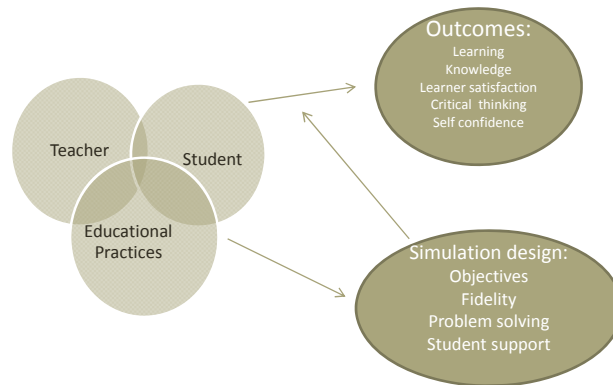
Acknowledgement: continued

- The views expressed in this presentation are those of the authors and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the US Government
- None of the persons on the investigative team has reported a conflict of interest
- The study protocol was approved by the Human Use Committee at Tripler Army Medical Center. Investigators adhered to the policies for protection of human subjects as prescribed in 45 Code of Federal Regulation 46

Research Question & Aim of Project

- Question: Is there a difference in competency based learning outcomes and cost effectiveness between learning that is supported by PC screen based simulation vs. high fidelity simulation for selected nursing trauma skills?
- Aim: Develop a model that can be used to compare PC screen based vs. high fidelity simulation based instruction
- Theoretical framework: Nursing Education Simulation Framework

Theoretical framework: Nursing Education Simulation Framework [NESF] (Jeffries, 2007)

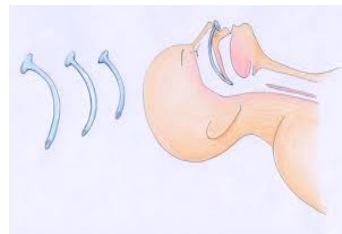


Development of the Model

- Design framework
 - Skill selection
 - Skill deconstruction
 - Assessment instruments
 - Training methodology
- Development framework
 - Content Accuracy and Training Equality Review
 - Instructional design
 - Pilot module
 - Complete modules
- Evaluation framework
 - Knowledge, skills, attitude, cost effectiveness

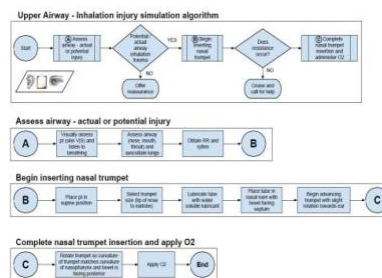
Skill Selection

- Criteria
 - Rarely taught skill
 - Critical thinking and psychomotor skills
 - Could be taught on high-fidelity mannequin
 - Could be taught with PC screen based training
- Choices
 - C-collar application
 - Tourniquet application
 - Nasal pharyngeal airway insertion



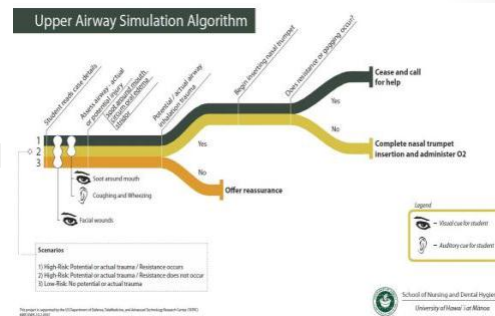
Skill Deconstruction

- Breakdown into steps
- Identify necessary tools (nasal pharyngeal, lubricant, etc...)
- Identify pre-requisite skills
- Map procedural steps



Skill Deconstruction (cont.)

- Identify choices requiring critical thinking
- Identify verbal and visual cues
- Add to procedural steps



Assessment Instruments

- Mapped to
 - Critical thinking choices
 - Identification of verbal and visual cues
 - Following procedural steps
- Evaluation procedure
 - Skill and knowledge assessment tests
 - Pretest, immediate posttest, 6-week posttest
- Cost model

Simulation Learning: PC-Screen Based (PCSB) versus High Fidelity Simulation (HFS).
Version #1 Date: 1 February 2012

Please read each statement and indicate your degree of confidence for each element of the skills noted below.

not at all confident=1; slightly confident=2; confident=3; highly confident=4

Cervical spine immobilization skill	1	2	3	4
1. I can recognize the need to immobilize a cervical spine				
2. I can recognize contraindications of applying a cervical collar				
3. I can select the correct size cervical collar				
4. I can correctly apply a cervical collar on an adult				
5. I can recognize indications for ceasing application of a cervical collar				

Acute hemorrhage control skill (tourniquet application)	1	2	3	4
1. I can recognize an acute hemorrhage situation				
2. I can correctly select use of a pressure dressing vs. application of a tourniquet for bleeding control				
3. I can correctly apply a tourniquet in under 15 seconds for bleeding control				
4. I can accurately assess the effectiveness of a tourniquet				
5. I can evaluate the risks vs. benefits for tourniquet use in situations				

Upper airway protection	1	2	3	4
1. I can recognize signs and symptoms of risk to upper airway patency				
2. I can recognize the need to protect the upper airway				
3. I can select the correct size of nasal airway device				
4. I can correctly insert a nasal airway				
5. I can recognize indications for ceasing insertion of a nasal airway				

Knowledge about the trauma nursing skills

Please read each question and select your choice for an answer.

1. A fall from what level is considered risk for cervical spine injury: ___ 10 ft. ___ 15 ft. ___ 20 ft. ___ 25 ft.
2. A cervical collar should only be applied if the patient has a significant history and actual symptoms of cervical spine injury. ___ This is false ___ This is true
3. Cervical collar application can result in accentuation of neurological symptoms ___ This is false ___ This is true

Training Methodology

- High-fidelity simulator training with instructor
 - PowerPoint overview
 - Practice on simulator
 - Students move on when comfortable
- PC screen based training
 - PowerPoint overview with audio
 - Video examples with audio
 - Self-paced instruction



Content Accuracy and Training Equality Review

- Team reviewer
 - Trauma subject matter expert
 - Simulation expert
- Each develop step reviewed
 - Lesson plans
 - Pilot
 - Final modules



Lesson Plans

- Lesson plan general
 - Introduction to topic
 - Relevance
 - Procedural steps
 - Visual and verbal cues
 - Critical thinking choices
- Equal training methods
 - High-fidelity training
 - PC Screen based training

Topics	Content Summary	IMP. JDR	PCSB	Time	Faculty
Introduction to acute hemiplegic control, its importance, and its relevance to control.	What is acute hemiplegic? What are the results of acute hemiplegic? The #1 priority is to maintain flow of blood. "Consulting most of prior learning/experience. Anticipate the learning process. It is easier for learners to learn information they can link to personal experience."	PowerPoint lecture followed by class discussion on any prior experience with acute hemiplegic control.	PowerPoint presentation with narrative audio followed by the learner typing in any prior experience with acute hemiplegic control into a laptop.	5 min	Dr. Kristine Gerschlager
Overview of acute hemiplegic control.	1) Assessing for actual or potential acute trauma 2) Applying a cervical collar	PowerPoint lecture briefly reviewing major steps of acute hemiplegic control. In-class demonstration of acute hemiplegic control.	PowerPoint presentation with narrative audio briefly reviewing major steps of acute hemiplegic control. Video demonstration with narrative audio of acute hemiplegic control.	5 min	Dr. Kristine Gerschlager

Pilot Module

- C-collar application
 - Articulate Software
 - PowerPoint
 - Audio recording tools
 - Video compression
 - Video annotation tools
 - PC screen based
 - Step-by-step with images and audio
 - Video example with audio
 - High-fidelity simulator
 - Step-by-step with images, no audio
 - Instructor provides hands on practice



Finalize Modules

- C-collar
- CAT Tourniquet
- Nasal pharyngeal airway



Model testing: participants

- Convenience sample (N=44)
- RN, with a minimum of a BS degree
- Active duty military (n=22); civilian (n=22)
- HFS vs. PCSB groups: NO differences in-
 - Age or gender
 - Highest degree
 - Prior trauma experience
 - Years working as an RN

Findings: Differences within groups HFS and PCSB

	Mean scores		
	Pre	Post	6 wk. Post
Confidence	➤ HF 2.35	➤ HF 3.46	➤ HF 3.24
	➤ PC 2.33	➤ PC 3.44	➤ PC 3.00
Knowledge	➤ HF .64	➤ HF .84	➤ HF .73
	➤ PC .67	➤ PC .81	➤ PC .76
Skills	➤ HF .39	➤ HF .85	➤ HF .90
	➤ PC .42	➤ PC .73	➤ PC .81

Confidence HF: diff between Pre & Post (p=.0001)Pre &6 wk. Post (p=.0001)
 PC: diff between Pre & Post (p=.0001)Pre &6 wk. Post (p=.0001)
 Knowledge HF: diff between Pre & Post (p=.0001)Pre &6 wk. Post (p=.024)
 PC diff between Pre & Post (p=.0006)Pre &6 wk. Post (p=.024)
 Skills: HF: diff between Pre & Post (p=.0001)Pre &6 wk. Post (p=.0001)
 PC: diff between Pre & Post (p=.0001)Pre &6 wk. Post (p=.0001)

Findings: Differences between groups HFS and PCSB

	P values for differences between HF and PC		
	Pre (baseline)	Post	6 wk. Post
Confidence	0.94	0.97	0.08
Knowledge	0.58	0.90	0.42
Skills	0.74	0.04	0.64

For this set of trauma nursing skills, there is no significant difference between improvement: HF and PC learning in terms of confidence, knowledge and skills. Both groups improved equally well.

Findings: Additional factors

- Does competency= knowledge, skills and attitude?
- Despite statistical significance, how much of a difference matters?
- Other key factors identified:
 - Fluidity
 - Timing
 - Demonstrated confidence (as opposed to reported)

Conclusions

- Overall, there is no difference between HF and PC learning outcomes for this set of skills
- Difficult to demonstrate actual competency in a dry lab setting
- For selected technical skills, not sure if the additional cost warrants the investment of high fidelity simulation for students with prior knowledge of basic nursing skills
- We found that the NESF model should be expanded to include additional formative factors, including comparability of syllabi and fidelity to lesson plans for the different simulation methods; critical step element identification; and summative factors including overall assessment of performance based on expanded factors such as fluidity, speed, accuracy; and cost.

Mahalo (thank you)

- Questions?



A Comparison of PC Screen-based vs. High Fidelity Simulation Supported Instruction for Trauma Nursing Skills in Terms of Learning and Cost



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A collaboration between University of Hawaii at Manoa, School of Nursing & the Tripler Army Medical Center

BACKGROUND

The number and complexity of natural disasters and military engagement continues to rise with increased numbers of wounded civilians and warriors. Core nursing competencies for trauma care have been established, but little is known about the most effective and efficient methods for teaching trauma nursing skills and functions using simulation.

WHY IS THIS RESEARCH QUESTION IMPORTANT?

Gaining an understanding of the educational outcomes and costs for a variety of simulation methods will enable educators to select the most appropriate method of instruction in light of learning outcomes and costs of instruction.

RESEARCH QUESTION

Is there a difference in competency based learning outcomes and cost effectiveness between learning that is supported by PC screen-based (PCSB) simulation vs. high fidelity simulation (HFS) for selected nursing trauma skills?

METHODS

Two groups of nurses were randomly assigned to either PCSB or HFS supported instruction for the three skills. Assessments for knowledge, skills, critical thinking, and sense of confidence were done at pre, immediate post and six week post intervals.

SAMPLE: 44 nurses (22 military and 22 civilian)

TRAUMA NURSING SKILLS AND FUNCTIONS

- Neurological: Cervical spine injury –C-collar use
- Airway: Inhalation injury- Insertion of nasal airway
- Circulation: Acute hemorrhage- CAT Tourniquet

OUTCOMES

LEARNING: Both groups (PCSB & HFS) significantly improved their scores for knowledge, skills, critical thinking and confidence from pre to post, and pre to six week post training. There was no significant difference between the groups by method or nurse type (military and civilian).

COST: A very significant difference in cost per unit of instruction if amortize equipment over 5 years PCSB cost \$55 per session vs. HFS cost \$410 per session.

DISCUSSION/SIGNIFICANCE OF OUTCOMES

Both methods of instructional support are effective. However, HFS supported instruction is very costly, and should be reserved for very complex skills, or procedures that require a large amount of teamwork.



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Appendix J. Participant Demographics

Categorical Variable	HFS (n=22)				PC (n=22)			HFS vs PC (N=44)	
	Civilian	Military	Total HFS	p-value*	Civilian	Military	Total PC	p-value (HFS vs PC)‡	
	n (%)	n (%)	n (%)		n (%)	n(%)	n(%)		
Gender									
Male	2 (18.2)	1 (9.1)	3 (13.6)	1.00	1 (9.1)	3 (27.3)	4 (18.2)	1.00	
Female	9 (81.8)	10 (90.9)	19 (86.4)		10 (90.9)	8 (72.7)	18 (81.8)		
Highest Degree									
Baccalaureate	3 (27.3)	8 (72.7)	11 (50.0)	0.087	5 (45.5)	9 (81.8)	14 (63.6)	0.76	
Master's	7 (63.6)	3 (27.3)	10 (45.5)		5 (45.5)	2 (18.2)	7 (31.8)		
Doctorate	1 (9.1)	0 (0.0)	1 (4.5)		1 (9.1)	0 (0.0)	1 (4.6)		
Worked in Trauma Unit/ED as RN									
No	9 (81.8)	8 (72.7)	17 (77.3)	1.00	8 (72.7)	8 (72.7)	16 (72.7)	1.00	
Yes	2 (18.2)	3 (27.3)	5 (22.7)		3 (27.3)	3 (27.3)	6 (27.3)		
Years Working as RN									
<5 years	5 (45.5)	6 (54.5)	11 (50.0)	1.000	3 (27.3)	7 (63.6)	10 (45.4)	1.00	
≥5 years	6 (54.5)	5 (45.5)	11 (50.0)		8 (72.7)	4 (36.4)	12 (54.6)		
Continuous Variable	mean (sd)	mean (sd)	Total HFS mean (sd)	p-value ¹	Total PC Civilian mean (sd)	Total PC Military	Total Mean (sd)	p-value (HFS vs PC) ²	
Years Experience as RN	16.6 (14.8)	10.5 (10.7)	13.7 (13.1)	0.30	17.1 (14.8)	4.7 (5.1)	12.2 (12.7)	0.86	
Age in Years	43.5 (16.0)	33.9 (11.9)	38.7 (14.6)	0.13	48.2 (12.3)	30.1 (9.3)	38.5 (14.1)	0.86	

*Exact test Comparing differences among nurse type within HFS Group

‡Exact test comparing HFS vs PC Group Differences

1. p-value1 = ttest comparing differences within HFS Group

2. p-value2 = Overall p-value

Appendix K.1 Confidence, Knowledge and Skills

Variable	HFS					PC1					PC2					PC (Total)					p-value (Baseline HFS vs PC) [†]	p-value (Baseline PC1 vs PC2) [‡]	p-value (Difference Post- Baseline: HFS vs PC) ^{††}	p-value (Difference Post - Baseline: PC1 vs PC2) ^{††}	p-value (Difference Post- Post - Baseline: HFS vs PC) ^{†††}	p-value (Difference Post- Post - Baseline: PC1 vs PC2) ^{†††}	
	Baseline	Post	p-value*	Post-Post	p-value**	Baseline	Post	p-value*	Post-Post	p-value**	Baseline	Post	p-value*	Post-Post	p-value**	Baseline	Post	p-value*	Post-Post	p-value**							
	mean (sd)	mean (sd)		mean (sd)			mean (sd)		mean (sd)		mean (sd)			mean (sd)													
Confidence																											
Spine Immobilization																											
1. Recognize need to immobilize																											
2. Recognize contraindications																											
3. Selecting correct size of Cx Collar																											
4. Correctly apply collar on patient																											
5. Recognize indications																											
Mean score	2.07 (0.72)	3.35 (0.44)	<.0001	3.01 (0.45)	<.0001	1.98 (0.66)	3.27 (0.57)	<.0001	2.83 (0.50)	<.0001	2.51 (0.82)	3.42 (0.49)	0.0038	3.00 (0.49)	0.011	2.25 (0.78)	3.35 (0.53)	<.0001	2.92 (0.49)	<.0001	0.45	0.12	0.43	0.25	0.43	0.87	
Mean score change and sd	1.28 (0.73)			0.94 (0.77)		1.29 (0.68)			0.85 (0.35)		0.91 (0.80)			0.49 (0.52)		1.10 (0.75)			0.67 (0.47)								
Acute Hemorrhage																											
1. Recognize acute hemorrhage situation																											
2. Correct select pressure dressing vs tourniquet																											
3. Correctly apply tourniquet in 15s																											
4. Accurately assess effectiveness																											
5. Evaluate risk vs. benefits																											
Mean score	2.34 (0.76)	3.50 (0.37)	<.0001	3.40(0.47)	<.0001	2.25 (0.74)	3.41 (0.58)	0.0008	3.00 (0.59)	0.0007	2.52 (0.71)	3.56 (0.44)	0.0003	3.13 (0.45)	0.028	2.39 (0.72)	3.49 (0.51)	<.0001	3.06 (0.51)	<.0001	0.81	0.39	0.76	0.70	0.76	0.39	
Mean score change and sd	1.16 (0.69)			1.06 (0.72)		1.16 (0.79)			0.75 (0.50)		1.04 (0.62)			0.60 (0.77)		1.10 (0.70)			0.67 (0.64)								
Upper Airway Protection																											
1. Recognize S/S of risk to airway patency																											
2. Recognize need to protect airway																											
3. Select correct size device																											
4. Correct insert nasal airway																											
5. Recognize indications for ceasing insertin																											
Mean score	2.62 (0.82)	3.53 (0.43)	<.0001	3.33 (0.49)	0.0004	2.08 (0.64)	3.49 (0.54)	<.0001	3.01 (0.77)	0.0008	2.65 (0.78)	3.47 (0.45)	0.0032	3.00 (0.53)	0.02	2.38 (0.76)	3.48 (0.48)	<.0001	3.01 (0.65)	<.0001	0.32	0.083	0.46	0.071	0.53	0.25	
Mean score change and sd	0.91 (0.77)			0.71 (0.77)		1.36 (0.58)			0.84 (0.53)		0.82 (0.70)			0.35 (0.41)		1.08 (0.69)			0.58 (0.53)								
Average Score for Confidence	2.35 (0.69)	3.46 (0.38)	<.0001	3.24 (0.40)	<.0001	2.09(0.63)	3.39 (0.54)	<.0001	2.95 (0.60)	0.0002	2.56 (0.73)	3.48 (0.42)	0.0007	3.04 (0.43)	0.0087	2.33 (0.71)	3.44 (0.48)	<.0001	3.00 (0.51)	<.0001	0.94	0.13	0.97	0.18	0.20	0.077	
Change in Avg Score of Confidence	1.12 (0.66)			0.90 (0.68)		1.30 (0.63)			0.86 (0.46)		0.92 (0.63)			0.48 (0.49)		1.11 (0.64)			0.67 (0.50)								
Knowledge																											
Cervical Injury (Q1-4) Yes/No																											
1. Risk for Cx Injury																											
Correct																											
Incorrect																											
2. Cx collar should be applied																											
Correct																											
Incorrect																											
3. Neurologic symptoms																											
Correct																											
Incorrect																											
4. Removing collar																											
Correct																											
Incorrect																											
Mean score	0.60 (0.15)	0.89 (0.15)	<.0001	0.61 (0.25)	0.86	0.55 (0.15)	0.82 (0.16)	0.0005	0.70 (0.19)	0.046	0.70 (0.15)	0.77 (0.18)	0.35	0.72 (0.18)	0.76	0.63 (0.17)	0.80 (0.17)	0.0019	0.72 (0.18)	0.089	0.64	0.023	0.069	0.028	0.069	0.76	
Mean score change and sd	0.28 (0.18)			0.01 (0.29)		0.27 (0.18)			0.16 (0.23)		0.07 (0.23)			0.02(0.24)		0.17 (0.22)			0.09 (0.24)								
Tourniquet (Q5-8)																											
1. Tourniquet preferred																											
2. Released q2 minutes																											
3. Tourniquet to the leg																											
4. Elevating Extremity																											
Mean score	0.64 (0.26)	0.85 (0.17)	0.0006	0.82 (0.21)	0.013	0.57 (0.32)	0.82 (0.12)	0.0079	0.82 (0.16)	0.013	0.75 (0.22)	0.82 (0.22)	0.28	0.70 (0.29)	0.65	0.66 (0.28)	0.82 (0.19)	0.0052	0.76 (0.24)	0.16	0.79	0.14	0.45	0.073	0.45	0.66	
Mean score change and sd	0.22 (0.25)			0.18 (0.31)		0.25 (0.25)			0.25 (0.27)		0.07 (0.20)			0.05 (0.31)		0.16 (0.24)			0.10 (0.32)								
Nasal Airway (Q9-12)																											
1. Beveled end																											
2. Unconscious																											
3. Preferred method																											
4. Suction nasal airway																											
Mean Score	0.68 (0.16)	0.78 (0.18)	0.033	0.76 (0.16)	0.11	0.68 (0.20)	0.84 (0.17)	0.089	0.86 (0.13)	0.038	0.75 (0.24)	0.77 (0.21)	0.45	0.75 (0.19)	0.76	0.71 (0.21)	0.81 (0.19)	0.059	0.81 (0.17)	0.071	0.58	0.48	0.90	0.32	0.90	0.42	
Mean score change and sd	0.10 (0.20)			0.08 (0.22)		0.16 (0.28)			0.18 (0.25)		0.05 (0.20)			0.03 (0.25)		0.11 (0.24)			0.11 (0.26)								
Average Score for Knowledge	0.64 (0.13)	0.84 (0.11)	<.0001	0.73 (0.14)	0.024	0.60 (0.15)	0.83 (0.10)	<.0001	0.80 (0.11)	0.0013	0.74 (0.16)	0.79 (0.12)	0.28	0.73 (0.11)	0.84	0.67 (0.17)	0.81 (0.11)	0.0006	0.76 (0.11)	0.024	0.55	0.054	0.16	0.0052	0.96	0.004	
Mean Change in Avg Score of Knowledge	0.20 (0.11)			0.09 (0.17)		0.23 (0.12)			0.20 (0.15)		0.05 (0.15)			0.01 (0.15)		0.14 (0.16)			0.09 (0.18)								

*Paired ttest comparing differences between baseline and 3 weeks post-training

**Paired ttest comparing differences between baseline and
6 weeks (post-post) training

Appendix K.2 Confidence, Knowledge, and Skills

Variable	HFS					PC1					PC2					PC (Total)					p-value (Baseline HFS vs PC) [†]	p-value (Baseline PC1 vs PC2) [†]	p-value (Difference Post - Baseline: HFS vs PC) ^{†‡}	p-value (Difference Post - Baseline: PC1 vs PC2) ^{†‡}	p-value (Difference Post-Post - Baseline: HFS vs PC) ^{†‡‡}	p-value (Difference Post-Post - Baseline: PC1 vs PC2) ^{†‡‡}	
	Baseline	Post	p-value*	Post-Post	p-value**	Baseline	Post	p-value*	Post-Post	p-value**	Baseline	Post	p-value*	Post-Post	p-value**	Baseline	Post	p-value*	Post-Post	p-value**							
	mean (sd)	mean (sd)		mean (sd)			mean (sd)		mean (sd)		mean (sd)			mean (sd)			mean (sd)			mean (sd)							
Cervical Collar Application																											
Patient Preparation (Yes/No) 1. Stabilize head manually 2. Instruct Pt to continue to remain still 3. Instruct Pt to Alert Health Providers 4. Remove jewelry around neck																											
Mean score		0.19 (0.20)	0.85 (0.20)	<.0001	0.65 (0.30)	<.0001	0.14 (0.21)	0.57 (0.34)	0.0025	0.39 (0.39)	0.050	0.14 (0.17)	0.50 (0.22)	0.004	0.43 (0.28)	0.0047	0.14 (0.18)	0.53 (0.28)	<.0001	0.41 (0.33)	0.0007	0.34	1.00	0.0087	0.65	0.060	0.75
Mean score change and sd		0.66 (0.29)			0.45 (0.31)		0.43 (0.36)			0.25 (0.37)		0.37 (0.32)			0.30 (0.27)		0.40 (0.33)			0.27 (0.32)							
Collar Preparation (Yes/No) 1. Select proper sized collar 2. Assemble the collar																											
Mean score		0.05 (0.15)	0.98 (0.11)	<.0001	0.91 (0.29)	<.0001	0.09(0.20)	0.86 (0.32)	<.0001	0.77 (0.41)	0.0014	0.27 (0.41)	0.82 (0.34)	0.015	0.91 (0.20)	0.0004	0.18 (0.33)	0.84 (0.32)	<.0001	0.84 (0.32)	<.0001	0.087	0.21	0.023	0.30	0.087	0.82
Mean score change and sd		0.93 (0.18)			0.86 (0.32)		Δ0.77 (0.34)			0.68 (0.51)		0.55 (0.61)			0.64 (0.39)		0.66 (0.50)			0.66 (0.45)							
Procedural Steps (Yes/No) 1. Return pts head to neutral position 2. Collar 3. Assess for accentuation																											
Mean score		0.12 (0.30)	0.98 (0.07)	<.0001	0.89 (0.30)	<.0001	0.15 (0.31)	0.85 (0.23)	0.0002	0.73 (0.47)	0.0025	0.30 (0.41)	0.58 (0.42)	0.15	0.85 (0.17)	0.0008	0.23 (0.36)	0.71 (0.36)	0.0004	0.79 (0.35)	<.0001	0.30	0.34	0.0059	0.055	0.089	0.87
Mean score change and sd		0.86 (0.30)			0.77 (0.39)		Δ 0.70 (0.38)			0.58 (0.47)		0.27 (0.57)			0.55 (0.37)		0.48 (0.52)			0.56 (0.42)							
CAT Tourniquet Application																											
Patient Preparation (Yes/No) 1. Expose site determine deg of blood loss 2. Informing Pt applying tourniquet																											
Mean score		0.34 (0.32)	0.77 (0.25)	<.0001	0.77 (0.30)	<.0001	0.23 (0.26)	0.68 (0.34)	0.0003	0.50 (0.39)	0.026	0.36 (0.39)	0.68 (0.34)	0.046	0.50 (0.32)	0.28	0.30 (0.33)	0.68 (0.33)	<.0001	0.50 (0.35)	0.017	0.65	0.35	0.67	0.41	0.062	0.40
Mean score change and sd		0.43 (0.32)			Δ 0.43 (0.42)		0.45 (0.27)			0.27 (0.34)		0.32 (0.46)			0.14 (0.39)		0.39 (0.38)			0.20 (0.37)							
Assemble Equipment (Yes/No) 1. Open CAT tourniquet package 2. Open Velcro																											
Mean score		0.64 (0.49)	1.0 (0.0)	0.0024	1.00 (0.00)	0.0024	0.50 (0.39)	0.91 (0.30)	0.0048	0.91 (0.30)	0.0048	0.86 (0.32)	1.0 (0.0)	0.20	1.00 (0.00)	0.20	0.68 (0.39)	0.95 (0.21)	0.0024	0.95 (0.21)	0.0024	0.74	0.03	0.50	0.080	0.50	0.08
Mean score change and sd		0.36 (0.49)			0.36 (0.49)		Δ0.40 (0.38)			0.41 (0.38)		0.14 (0.33)			0.14 (0.33)		0.27 (0.37)			0.27 (0.37)							
Procedural Steps (Yes/No) 1. Insert wounded extremity through tourniquet 2. Pull tourniquet band tight 3. Twist windlass rod until BRB stopped 4. Lock in place windlass rod 5. Adhere band cover over windlass road 6. Secure tourniquet 7. Reassess cessation of bleeding																											
Mean score		0.47 (0.43)	1.00	<.0001	0.94 (0.20)	<.0001	0.26 (0.40)	0.84 (0.33)	0.0010	0.83 (0.29)	0.0012	0.49 (0.39)	0.95 (0.07)	0.0029	0.88 (0.22)	0.0047	0.38 (0.40)	0.90 (0.24)	<.0001	0.86 (0.25)	<.0001	0.48	0.18	0.92	0.460	0.92	0.29
Mean score change and sd		0.53 (0.43)			0.47 (0.44)		0.58 (0.42)			0.57 (0.42)		0.45 (0.38)			0.39 (0.36)		0.52 (0.40)			0.48 (0.39)							
Nasal Airway Insertion																											
Patient Preparation (Yes/No) 1. Place Pt in supine position or high fowlers 2. ID largest nostril, assess for FB, SD, polyps																											
Mean score		0.43 (0.39)	0.98 (0.11)	<.0001	1.00 (0.00)	<.0001	0.41 (0.38)	0.77 (0.34)	0.024	1.00 (0.00)	0.0005	0.59 (0.38)	0.77 (0.26)	0.0047	1.00 (0.00)	0.018	0.50 (0.38)	0.77 (0.30)	0.02	1.00 (0.00)	<.0001	0.56	0.27	0.056	0.420	0.56	0.27
Score Change (mean change and sd)		0.55 (0.41)			0.57 (0.39)		0.37 (0.45)			0.59 (0.38)		0.19 (0.56)			0.0047	0.018	0.27 (0.50)			0.50 (0.38)							
Assemble Equipment (Yes/No) 1. Water soluble lubricant 2. Suction equipment 3. Selecting correct sized NP airway																											
Mean score		0.64 (0.41)	0.95 (0.12)	0.0030	0.92 (0.25)	0.0039	0.60(0.33)	0.85 (0.23)	0.071	1.00 (0.00)	0.0026	0.67 (0.30)	0.88 (0.22)	0.067	0.97 (0.10)	0.0047	0.64 (0.31)	0.86 (0.22)	0.0078	0.98 (0.07)	<.0001	1.00	0.66	0.46	0.850	0.59	0.49
Mean score change and sd		0.32 (0.44)			0.29 (0.42)		0.24 (0.40)			0.39 (0.33)		0.41 (0.38)			0.30 (0.28)		0.23 (0.36)			0.35 (0.30)							
Procedural Steps (Yes/No) 1. Lubricate tube with water-soluble agent 2. Passing airway 3. If resistance is met 4. Assess for patency																											
Mean score		0.67 (0.4)	0.99 (1.05)	0.0024	0.98 (0.07)	0.0018	0.75 (0.27)	0.89 (0.23)	0.26	0.98 (0.08)	0.034	0.66 (0.41)	0.80 (0.27)	0.43	0.98 (0.08)	0.018	0.70 (0.34)	0.84 (0.25)	0.18	0.98 (0.07)	0.0011	0.77	0.55	0.19	1.00	0.77	0.54
Mean score change and sd		0.32 (0.43)			0.31 (0.40)		0.14 (0.38)			0.23 (0.31)		0.14 (0.54)			0.32 (0.37)		0.14 (0.45)			0.27 (0.34)							
Average of Total Score for Skill Assessment																											
Change in Avg Total Score for Skill Assessment		0.39 (0.21)	0.85 (0.05)	<.0001	0.90 (0.14)	<.0001	0.35 (0.17)	0.73 (0.17)	<.0001	0.79 (0.18)	<.0001	0.48 (0.24)	0.74 (0.12)	0.0085	0.84 (0.08)	<.0001	0.42 (0.21)	0.73 (0.15)	<.0001	0.81 (0.14)	<.0001	0.74	0.15	0.042	0.26	0.064	0.31